BRIDGE AND BUILDING NUMBER

NOVEMBER, 1949

Railway Engineering and Maintenance

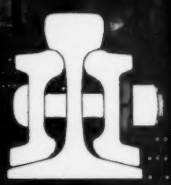
No matter how beautiful the track—whether curved or tangent, level or on grade, the constant stress and shock of fast passengers and heavily loaded freights keep it under almost continuous wear and tension.

In all parts of the country, under all conditions of weather, the pounding, the wear and the pressures continue night and day.

That is why Improved Hipowers offer invaluable service—equalizing bolt tensions, protecting rail ends and lessening tremendously the task of track maintenance.

IMPROVED HIPOWERS

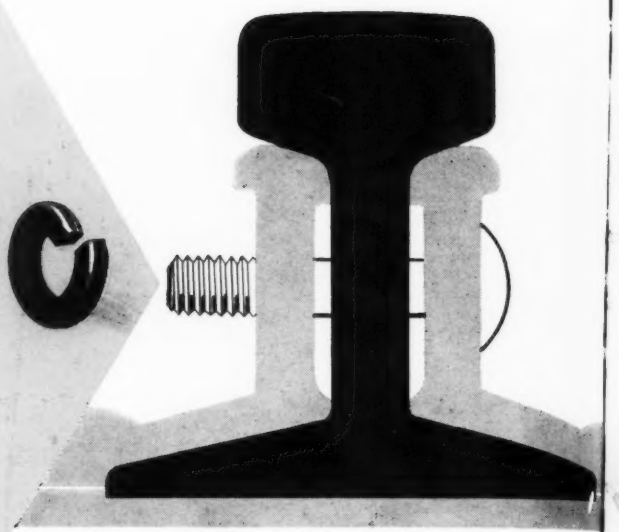
IMPROVE TRACK



ATIONAL LOCK WASHER COMPANY, NEWARK 5, N. J., U. S. A.

A COMPLETE LINE OF RAILWAY SPRING WASHERS

FIRST STEP TO MAINTENANCE ECONOMY



- *A reliable tension device backing up a joint bolt nut is a step toward maintenance economy*
- Using Reliance Hy-Pressure Hy-Crome Spring Washers on track joint bolts is the important first step to economical maintenance. They help reduce rail end batter and joint bar sag, provide a smoother riding track and, by automatically compensating for looseness, keep joint bolts under uniform tension, effecting a reduction of maintenance expense without sacrifice of security.
- With thirty-seven years of experience in supplying railroad spring washer needs, while keeping pace with changing conditions and more exacting requirements through service and laboratory tests, we have been able to develop improved spring washer technique. In the Hy-Crome Spring Washer family can be found a type of spring washer to meet every bolt and service requirement, keeping bolts tighter longer.

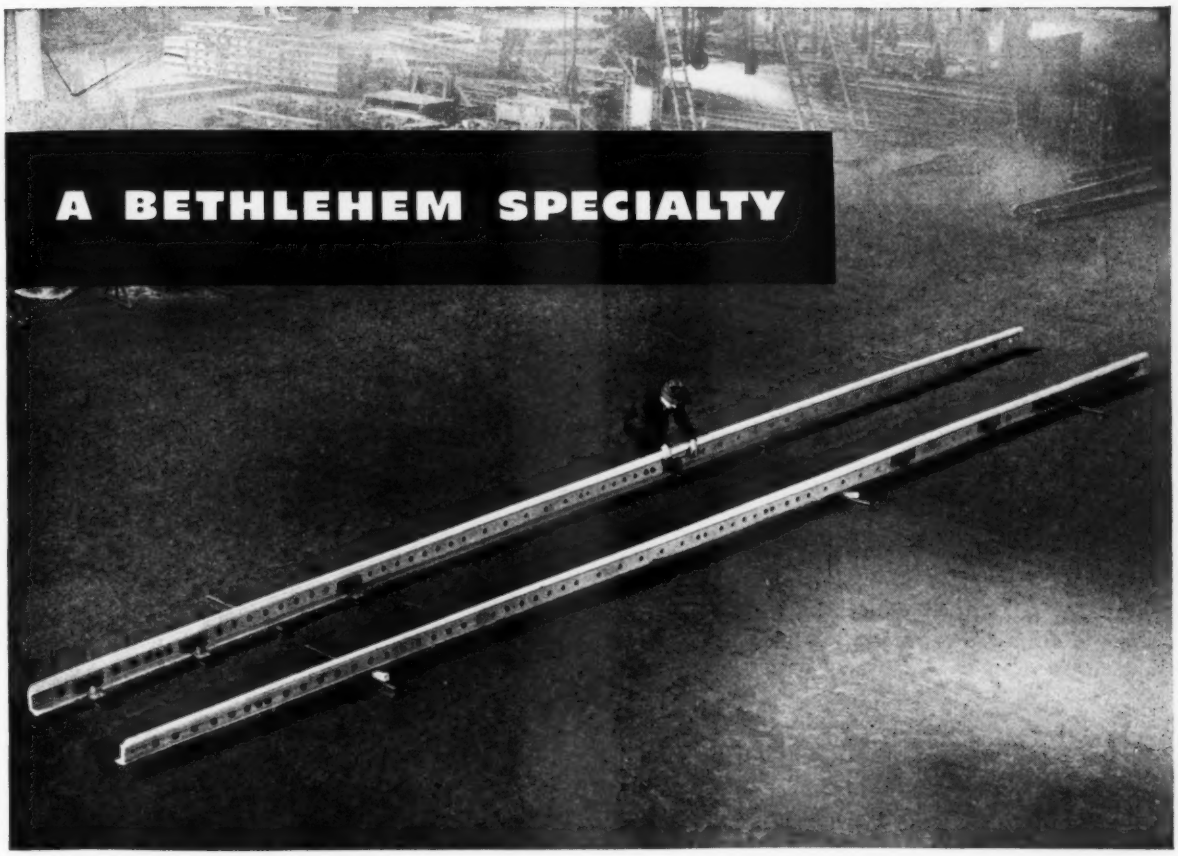
EATON

RELIANCE HY-PRESSURE HY-CROME SPRING WASHERS

EATON MANUFACTURING COMPANY

RELIANCE DIVISION, MASSILLON, OHIO

Sales Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco, Montreal



Heat-Treated Switch Points in any length to 45 feet

The points shown here are extra-long, and it takes unusual facilities to heat-treat pieces of this nature. But Bethlehem can do it easily. Jumbo-size equipment, specially designed for the purpose, enables us to treat long points as effectively and readily as we do the little fellows.

So if your design calls for long switch points, and your metallurgists say "Heat-treat," remember that we can take care of your needs. It goes without saying that we also have full facilities for the making and treating of smaller units, in all standard sizes.

As a matter of fact, Bethlehem makes just about everything in track and track accessories, including rails, switches, switch stands, braces, frog plates, guard rails, and many other items. Call us when you have a track problem; you'll be calling one of the oldest, most experienced hands in the business.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Published monthly by Simmons-Boardman Publishing Corporation 79 W. Monroe St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00 for one year; $3.00 for two years. Single copies 50 cents. Entered as second-class matter January 29, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry pending at Marion, Ind., post office. Address communications to 79 W. Monroe St., Chicago 3, Ill. Volume 45, No. 11.

CLEAN FLANGEWAYS of snow and ice

- **EASIER . . .** *power does the work*
- **FASTER . .** *takes minutes, no hand work*
- **CLEANER . .** *Predetermined depth and width assures perfect job*

WOOLERY No. 300 Motor Car with Flangeway Cleaner and sanders attached.

FLANGEWAY CLEANER QUICKLY ATTACHED to WOOLERY No. 300 Motor Car with only 6 bolts. Flangeway Cleaner is adjustable by lever action to a pre-determined depth. Heavy steel guards deflect ice and snow away from flangeways. V Belt and roller chain drive assures full power under all conditions.

WITH THE NEW

WOOLERY

DUAL PURPOSE

FLANGEWAY CLEANER and 300 MOTOR CAR

Provides Greater Operating Safety by eliminating snow and ice from flangeway at crossings and alleyways. One operator with the WOOLERY No. 300 Self-propelled Flangeway Cleaner will clear miles of track making it safe for heavy rail traffic.

SANDERS for the Woolery No. 300 Motor Car are available when desired.

THE WOOLERY No. 300 MOTOR CAR with its axle arrangement reduces maintenance cost to a minimum; with a draw bar pull of 405# under test it has pulled up to 20,000# on level track. This is equivalent to twice the load any car of similar weight will pull. The selective differential can be released in advance for taking car on or off track.

New 4 Wheel Drive plus Differential when needed makes the Woolery No. 300 an outstanding motor car. The 4 wheel drive doubles the traction and reduces weaving action of the car regardless of the direction of travel. With the 4-wheel drive there are no idling front wheels to consume power and decrease operating efficiency. All the weight of the car, men and tools, is on the driving wheels, front and rear contributing to increased traction and utilizing the full power of the engine wherever needed. Traction being provided on all 4 wheels they all wear evenly.

Write for Bulletin No. 178 today. Order your Woolery No. 300 motor car with the Flangeway Cleaner attachment now. Be prepared for the stormy weather ahead.

WOOLERY MINNEAPOLIS

WOOLERY MACHINE COMPANY

MINNEAPOLIS MINNESOTA

Pioneer Manufacturers of **RAILWAY MAINTENANCE EQUIPMENT**

RAILWAY WEED BURNERS • MOTOR CARS • FLANGEWAY CLEANERS • TIE CUTTERS • TIE PLATE SPACERS • RAIL JOINT OILERS • CREOSOTE SPRAYERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENN.

In the heart of the job—
on America's Leading Railroads . . .

THE leading railroads of the country have proved Northwests on their maintenance-of-way and storeyard jobs. The Northwest Crawler is a real railway man's machine. Its simplicity alone makes it worth considering. The rugged design and construction with its cast steel bases and cast steel machinery side frames, stands up under heavy railway service — keeps shafts in alignment — and reduces wear. Easy operation, the result of the "Feather-Touch" Clutch Control, increases operating safety and keeps the output curve up. Northwest steering and Northwest Crawlers, with their self-cleaning action, takes Northwests where other machines have difficulty and make loading and unloading easier.

You are making long-time plans. The Northwest is the machine for the heart of your maintenance-of-way jobs and you can't afford to have anything but the best in the heart of the job! Plan to have Northwests in those *Key Spots*. Make it the Key Machine and your first Northwest will make you a repeat order buyer.

NORTHWEST ENGINEERING CO.
1513 Field Bldg., 135 South LaSalle St.,
Chicago 3, Illinois

NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL

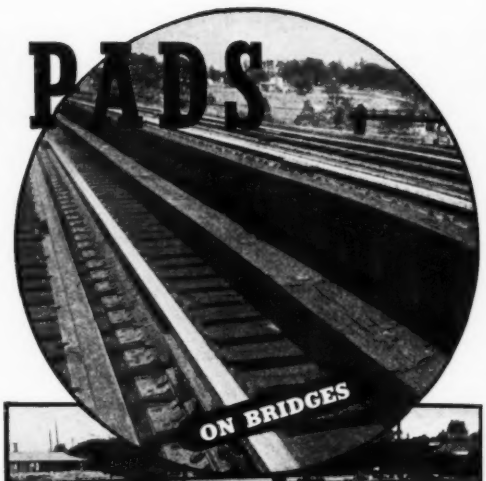
FABCO TIE PADS

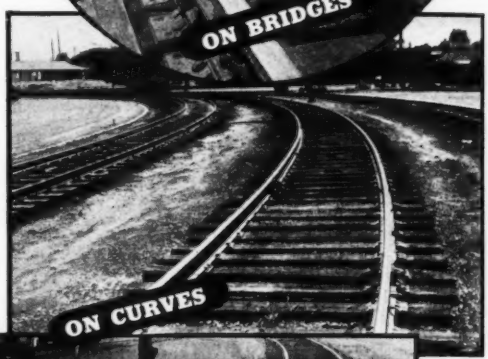
REDUCE MECHANICAL WEAR OF TIES

By reducing the plate cutting of ties Fabco Tie Pads save you money in two ways. (1) They extend tie life. (2) They reduce to a minimum the need for regauging.

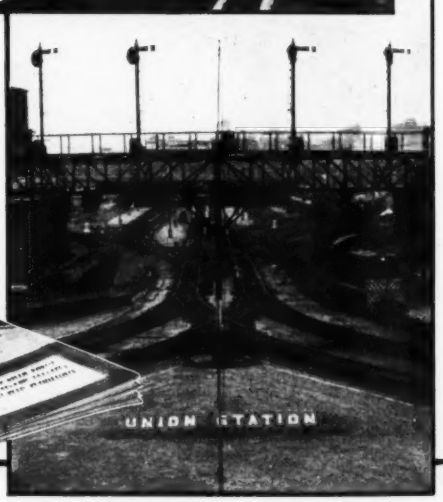
17 REASONS WHY YOU SHOULD USE FABCO TIE PADS

1. Prevent cutting of ties by plates.
2. Extend tie life.
3. Reduce labor costs by less frequent tie renewal.
4. Maintain gauge.
5. Save labor of regauging.
6. Have exceptionally long life — comparable to tie life.
7. Withstand extremes of temperature, moisture, brine, sand.
8. Have great strength under load.
9. Do not squash or crush under extremes of temperature or long service.
10. Permanent resiliency assures tight spikes.
11. Resilient winter and summer.
12. Cushion track structure from impacts.
13. Assist in maintaining line and surface.
14. Large tie plates unnecessary.
15. Compensate uneven bearing surfaces.
16. May be transferred from one location to another.
17. Low pad cost.





and STATION APPROACHES



Made by the Makers of Fabreeka with over 15 Years Experience in Track

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PRODUCTS COMPANY
INCORPORATED
222M SUMMER STREET
BOSTON 10, MASS.

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CHICAGO
PHILADELPHIA
SPARTANBURG
OAKLAND

Please send me latest Fabco Tie Pad literature.

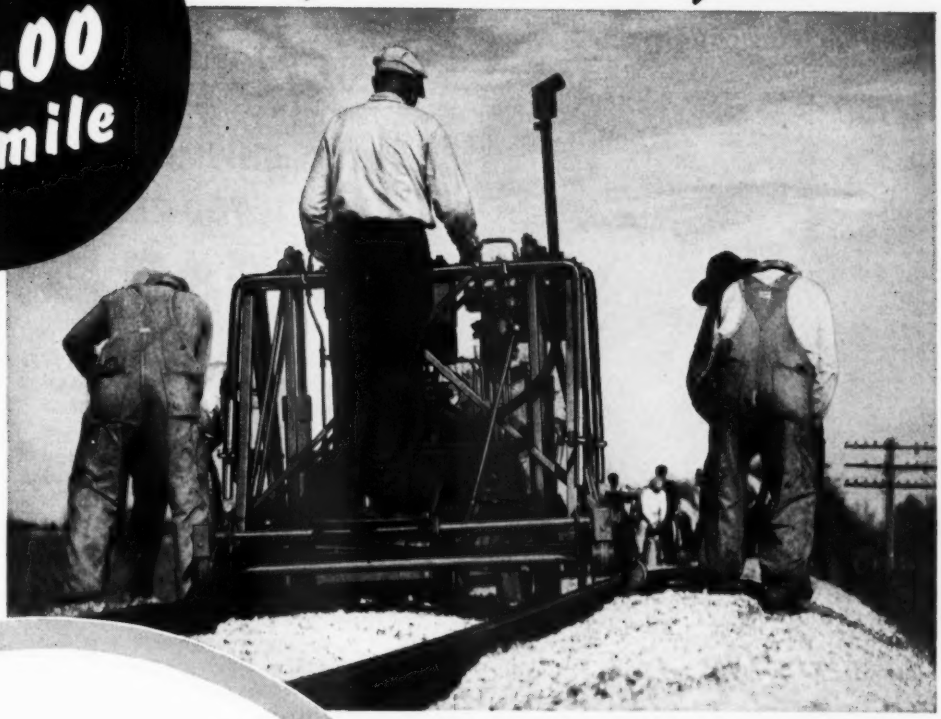
NAME.....

FIRM.....

ADDRESS.....

SAVE $170.00 per mile

. . . by using NORDBERG *Hydraulic Power Jacks*



for Reballasting Jobs

HERE is an example of the time and money saving ability offered through the use of Nordberg Hydraulic Power Jacks:

On twelve selected raising jobs, all of which employed modern tamping equipment, and which were raising track at the high average of 2115 track feet per day, *the Nordberg BJ Jack proved that it paid for itself in savings in only 13.8 miles . . . 34.5 working days.*

For further details covering the use of Nordberg Hydraulic Power Jacks, write for a copy of Bulletin 138.

R1149

. . . another example of

REDUCED MAINTENANCE COSTS

made possible by NORDBERG MACHINES

Look to **NORDBERG**

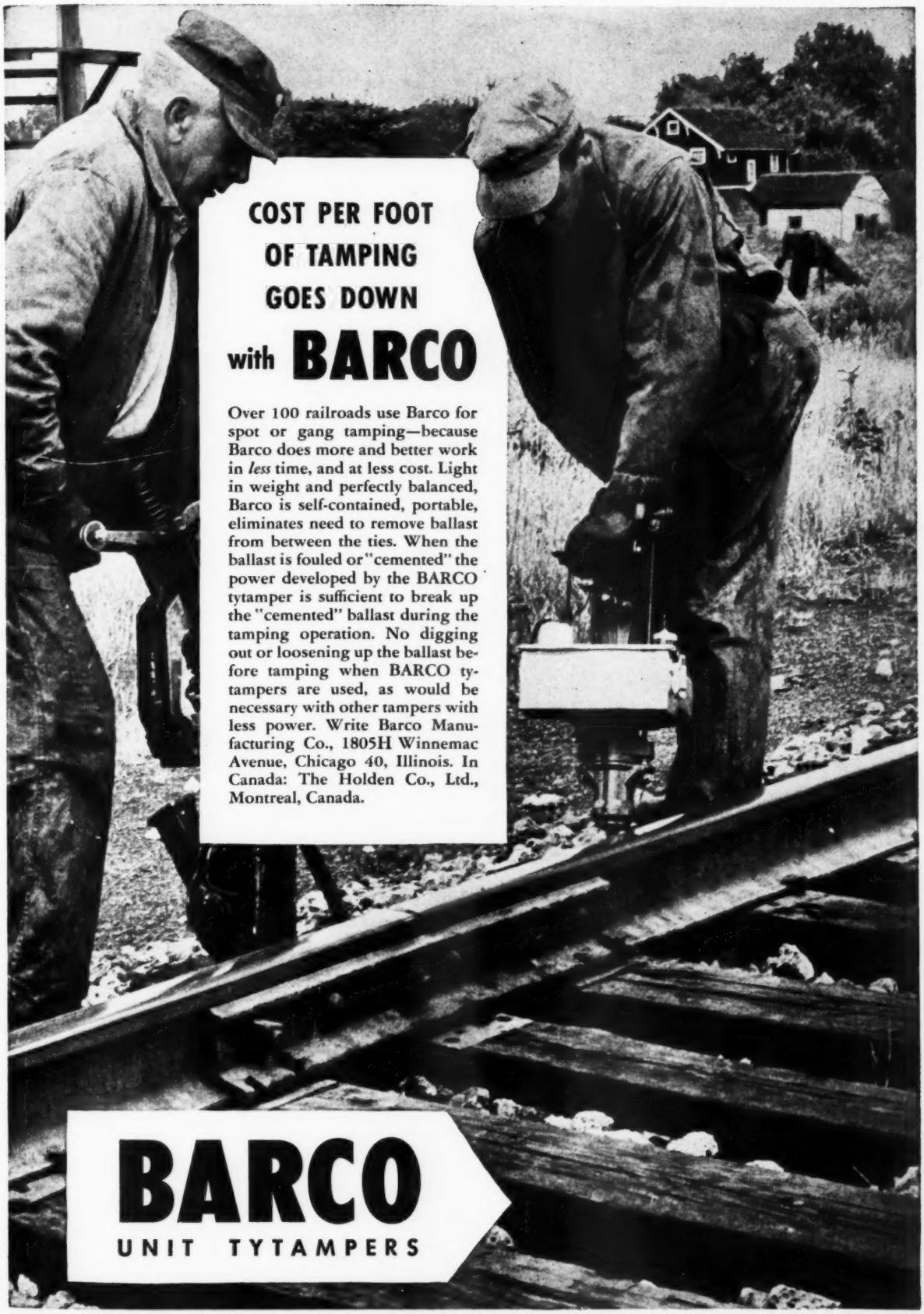
. . . for continually improved TRACK MAINTENANCE MACHINERY *to do a Better, Faster Maintenance Job at Lower Cost*

NORDBERG MFG. CO., Milwaukee 7, Wisconsin

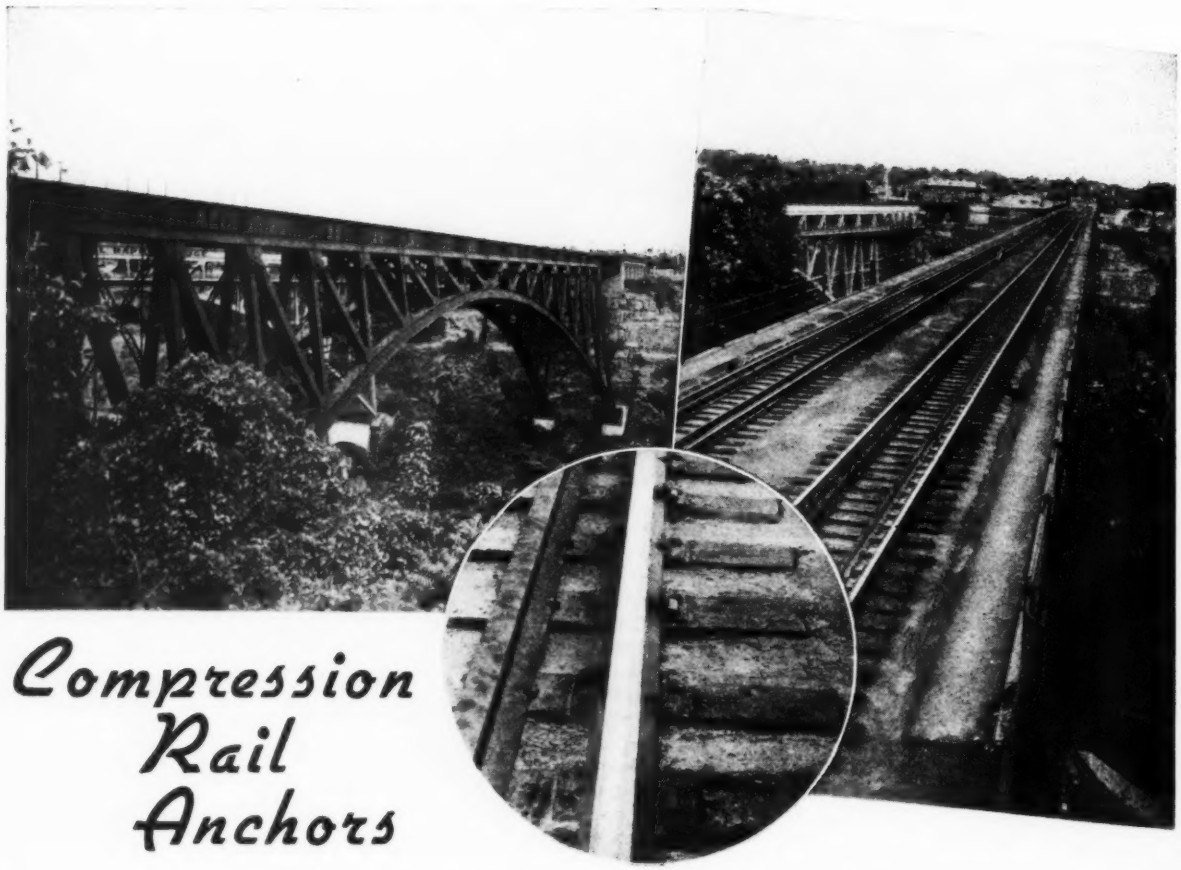
Weeds are Your Problem . . . Weed Control is Our Business

CHIPMAN CHEMICAL COMPANY, INC.
CHICAGO · HOUSTON · BOUND BROOK, N. J. · PALO ALTO · PORTLAND
Railroad Weed Control Service Since 1912

A COMPLETE LINE OF WEED KILLING CHEMICALS


COST PER FOOT
OF TAMPING
GOES DOWN
with BARCO
Over 100 railroads use Barco for spot or gang tamping—because Barco does more and better work in *less* time, and at less cost. Light in weight and perfectly balanced, Barco is self-contained, portable, eliminates need to remove ballast from between the ties. When the ballast is fouled or "cemented" the power developed by the BARCO tytamper is sufficient to break up the "cemented" ballast during the tamping operation. No digging out or loosening up the ballast before tamping when BARCO tytampers are used, as would be necessary with other tampers with less power. Write Barco Manufacturing Co., 1805H Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.
BARCO
UNIT TYTAMPERS

FREE ENTERPRISE • THE CORNERSTONE OF AMERICAN PROSPERITY



Compression Rail Anchors

on FAMOUS NIAGARA BRIDGE

"One of the largest, most thorough and effective bridge deck waterproofing jobs ever carried out on the railways" describes the work accomplished on New York Central's famed 977-ft. span over the Niagara gorge. The track is waterproofed both above and below the ballast. The rail is efficiently and economically held against two-way creepage with Compression Rail Anchors.

THE RAILS COMPANY

General Office
178 GOFFE STREET, NEW HAVEN 11, CONN.

ST. LOUIS, MO. HOBOKEN, N. J. CHICAGO, ILL.

Before you decide

Ask users about the REMARKABLE JACKSON MULTIPLE TAMPER

Or rent one to find out on your own track how you can put up track better, cheaper and faster.

A few machines are available for rental. Experienced field men will assist you with the initial installation and suggest means and methods of taking full advantage of this machine's extraordinary, proved potentials.

Write, wire or phone for complete details.

ELECTRIC TAMPER & EQUIPMENT CO.

LUDINGTON - - - MICHIGAN

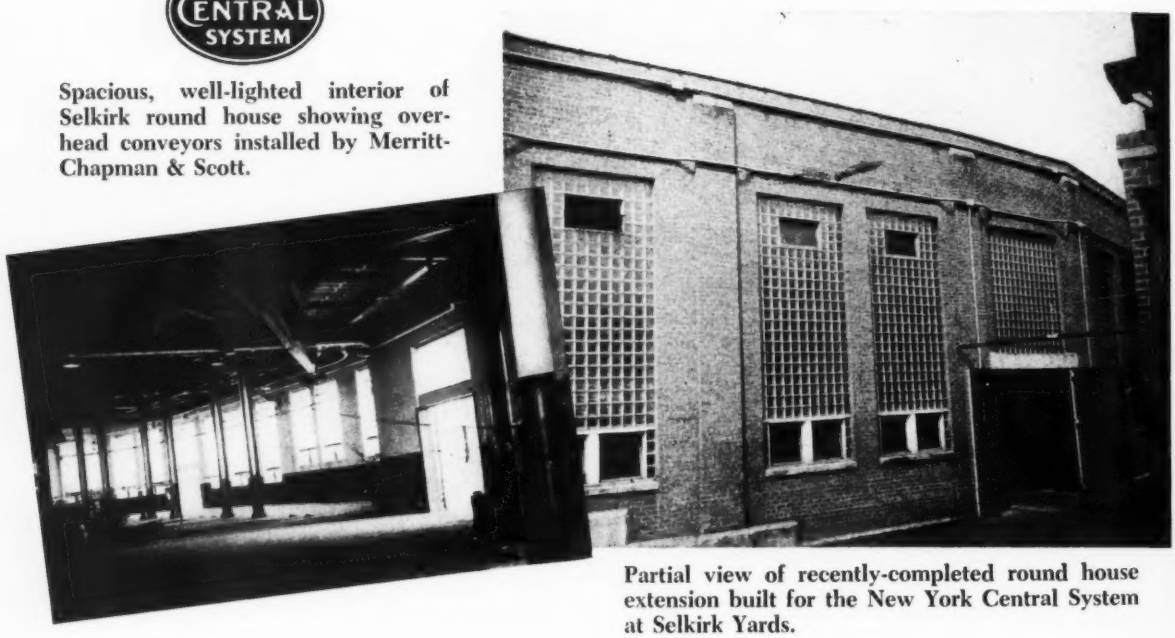
Modern . . . Profitable

TERMINAL FACILITIES

Built by **MERRITT-CHAPMAN & SCOTT**

NEW YORK CENTRAL SYSTEM

Spacious, well-lighted interior of Selkirk round house showing overhead conveyors installed by Merritt-Chapman & Scott.



Partial view of recently-completed round house extension built for the New York Central System at Selkirk Yards.

Add to a long list of outstanding Merritt-Chapman & Scott railroad construction jobs, the recently-completed extension and modernization of a key New York Central round house at Selkirk Yards, near Albany, N. Y. This job included the installation of drop tables and overhead conveyors, also construction of a wheel lathe room and cleaning room.

Here again, Merritt-Chapman & Scott had the important blend of experience, equipment and skill so essential to successful, on-time completion of railroad work. An organization of railroad and marine specialists with a solid background of many years' experience, we build terminal facilities, yards, docks, bridges, bulkheads, coal dumpers, etc.

Let us consult with you on your next job.

A Partial List of Railroads We Have Served . . .

Baltimore & Ohio R.R. System
Canadian National Rys.
Delaware, Lackawanna & Western R.R.
Duluth, Missabe & Iron Range Ry.
Duluth, South Shore & Atlantic Ry.
Great Northern Ry.
Lehigh Valley R.R.
Maine Central R.R.
New York Central System
New York, Chicago and St. Louis R.R.
New York, New Haven & Hartford R.R.
New York, Ontario and Western Ry.
Northern Pacific Ry.
Pennsylvania R.R.
Pere Marquette Ry.
Reading Ry. System
Wheeling & Lake Erie Ry.
Union Pacific R.R.

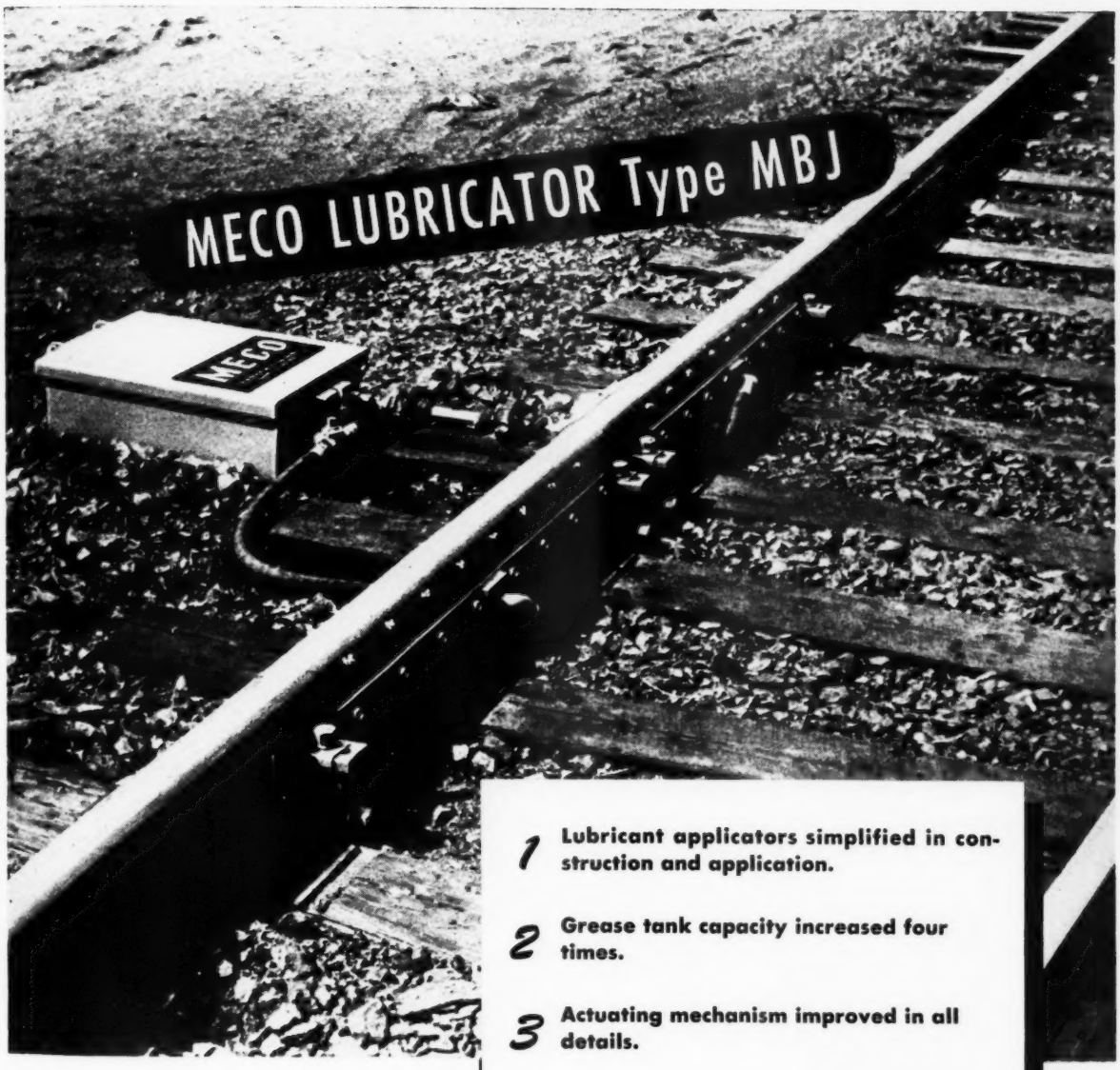
Your Confidence is Justified — Where This Flag Flies

MERRITT-CHAPMAN & SCOTT CORPORATION

General Offices: 17 Battery Place, New York 4, N. Y.

NEW LONDON, CONNECTICUT • CLEVELAND, OHIO

IMPROVED



1 **Lubricant applicators simplified in construction and application.**

2 **Grease tank capacity increased four times.**

3 **Actuating mechanism improved in all details.**

4 **Can be re-applied on rails of other section.**

★ **Maintenance Equipment Company** ★

RAILWAY EXCHANGE BUILDING • CHICAGO 4, ILLINOIS

3008

The MONOTUBE Method

gives bridges a good start in life

EXPERIENCED engineers, architects and builders who plan long-lived projects specify Monotube tapered steel piles—time after time.

That's because Monotubes have proved on all kinds of foundation work—for bridges, buildings, highways, piers—that they reduce costs . . . save time.

Consider these Monotube advantages: *Their fluted, tapered design speeds driving. They're light in weight, easily handled, extendible right on the job. Tubular construction makes inspection, before concreting, quick and easy. Sturdily built to eliminate use of driving mandrell.*

To make your building plans come true, depend on Monotubes to give them a good start in life. Available in gauge, size and taper to meet varying soil conditions. Complete information on request. Write the Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles

Super-Service Station for SAND

This latest Fairbanks-Morse sand station is tailored to meet requirements for faster turnaround service for diesel locomotives. Six delivery hoses, supplying sand from two elevated five-ton storage tanks, conveniently reach all locomotive sandboxes at a single spotting on the track. And there's no fighting the heavy hose—the new Fairbanks-Morse sand nozzles are quickly and easily opened by pressure against any point on the projecting rings. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

Closed and open positions of enclosed and weatherproof Fairbanks-Morse diesel locomotive sand nozzle. Without need for springs or levers, valve is held closed by gravity weight of sand when not in service — and is opened by pressure of projecting ring against lip of locomotive sandbox.

Let Allis-Chalmers Off-Track Equipment Help You

Meet the Challenge

Rugged Allis-Chalmers Diesel Tractors and Motor Graders do more work in fewer hours — put in as much as 50 percent more working time than rail-bound equipment. They are quickly transported from job to job by flat car, trailer or under their own power — go into action immediately — get the job done in a hurry.

A-C Equipment Helps You Modernize Construction and Maintenance Methods— Brings Substantial Savings in Time and Money

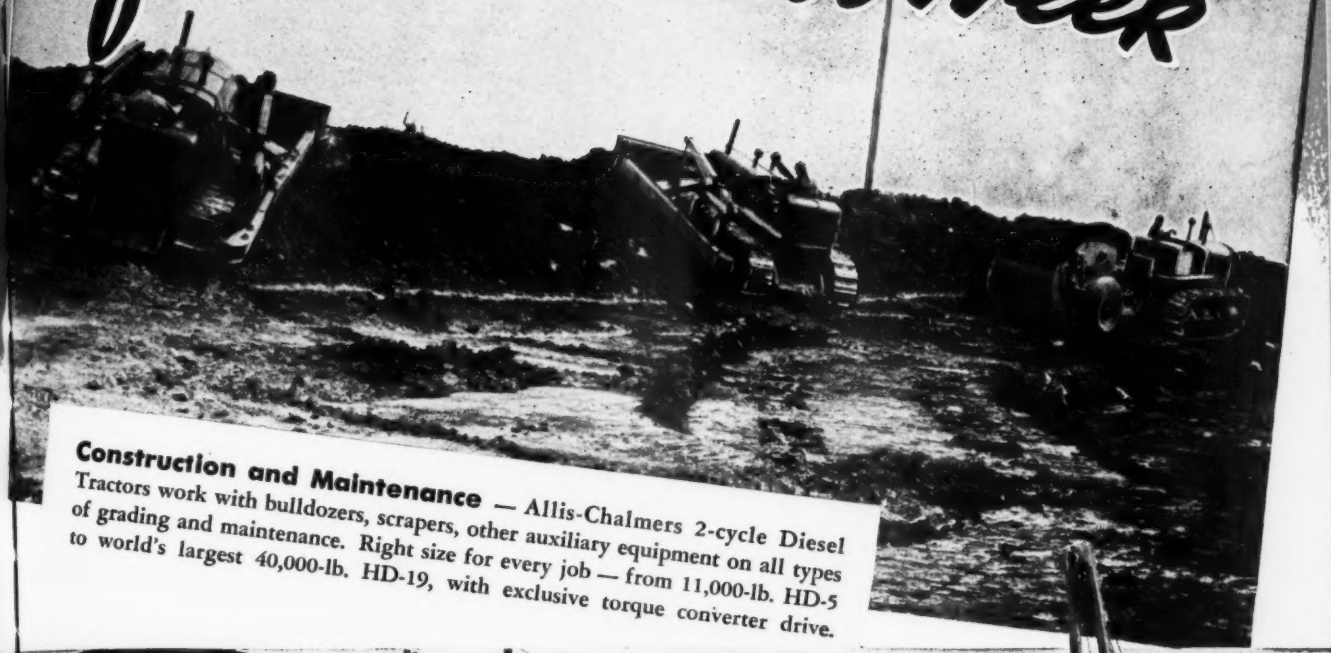
Building and Maintaining Access Roads—sloping, backfilling, widening shoulders, cutting out and reshaping ballast, removing snow, scarifying — these are some of the jobs handled effectively by A-C motor graders. Four heavy-duty diesel models, 50.4 to 104 brake hp., 17,772 to 22,140 lb. Also, the new low-cost gasoline-powered Model D for lighter work.

Handling Ballast or Other Material is easy with the Allis-Chalmers HD-5G and Tracto-Shovel. This outfit can dig, carry, dump and spread — is ideal for all-around work. Various interchangeable attachments widen usefulness — heavy-duty bulldozer blades, V-type snow plow and special sizes and types of buckets and bucket teeth.

Stockpiling and Reclaiming Coal is simplified with A-C tractors. Storage piles can be placed wherever there is available space — without expense for conveyors, tracks, etc. Hauling and compacting with tractor-scraper units or bulldozers cuts down heat loss and danger of fire. Self-loading scrapers facilitate reclaiming coal.

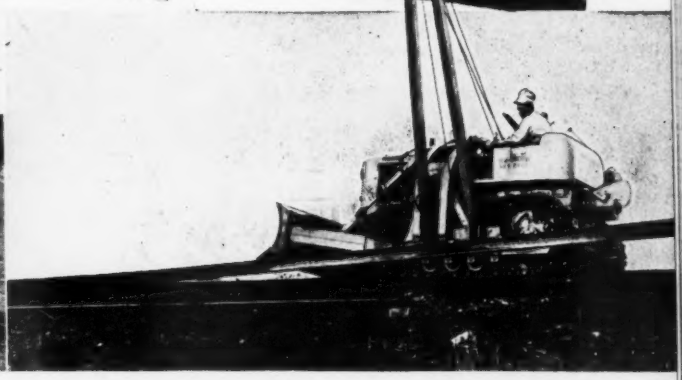
Mowing, Hauling, Sweeping are jobs for which the Model IB Wheel Tractor is ideally suited. Compact enough to get into tight places, powerful enough for any job. Electric lights and starting. With mower it handles slopes 85° above to 40° below horizontal. Rugged 5- or 6-ft. cutter bar is hydraulically raised and lowered.

of the 40-hour Week



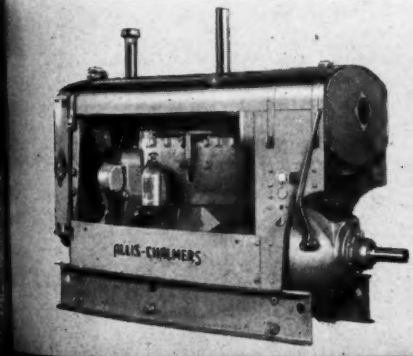
Construction and Maintenance — Allis-Chalmers 2-cycle Diesel Tractors work with bulldozers, scrapers, other auxiliary equipment on all types of grading and maintenance. Right size for every job — from 11,000-lb. HD-5 to world's largest 40,000-lb. HD-19, with exclusive torque converter drive.

Clearing Derailments, Repairing Washouts or Washins, A-C diesel tractors can put tracks back in service in a fraction of the time required by rail-bound equipment. Go to work anywhere along track — not just at ends of tie-up. If necessary, they build a shoofly around paralyzed section in record time.



Laying Rails goes faster, easier with this HD-5. Equipped with a side-boom, it replaces costly draglines and cranes for this type of work. Angledozer on tractor broadens its field of usefulness.

Any Power Requirement—A-C Power Units are high in torque, provide heavy-duty power for any service, steady or intermittent. Mass produced for lowest cost, along with engines by the thousands for tough tractor service. Nation-wide service. Choice of fuels. Five models, open or enclosed, 15 to 110 hp.



Write for complete information on modern, proved Allis-Chalmers off-track work equipment, or let us put you in touch with your Railroad dealer.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

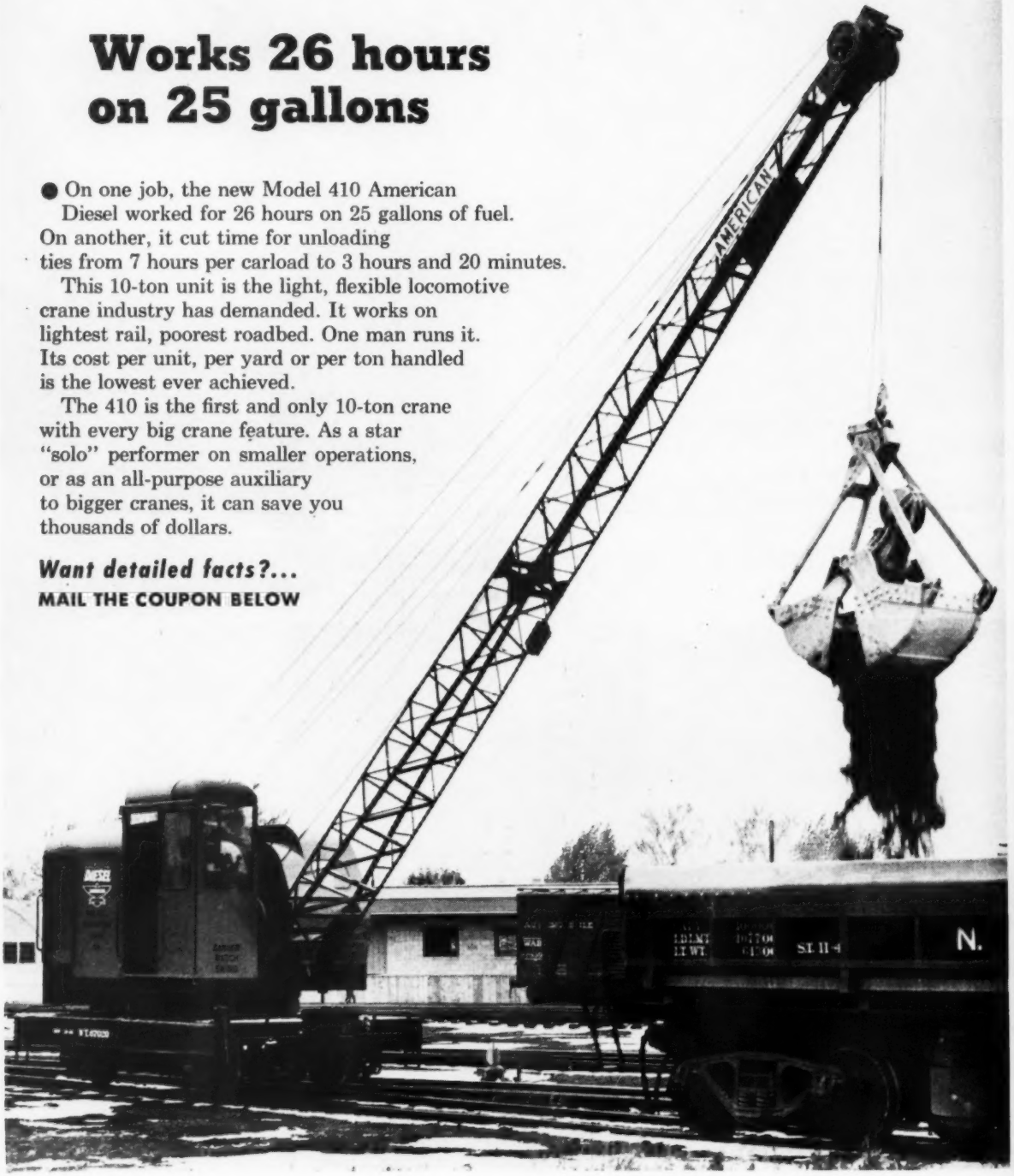
Works 26 hours on 25 gallons

● On one job, the new Model 410 American Diesel worked for 26 hours on 25 gallons of fuel. On another, it cut time for unloading ties from 7 hours per carload to 3 hours and 20 minutes.

This 10-ton unit is the light, flexible locomotive crane industry has demanded. It works on lightest rail, poorest roadbed. One man runs it. Its cost per unit, per yard or per ton handled is the lowest ever achieved.

The 410 is the first and only 10-ton crane with every big crane feature. As a star "solo" performer on smaller operations, or as an all-purpose auxiliary to bigger cranes, it can save you thousands of dollars.

Want detailed facts?...
MAIL THE COUPON BELOW



American Hoist
and DERRICK COMPANY
St. Paul 1, Minnesota

Plant No. 2: So. Kearny, N. J.
Sales Offices: NEW YORK • PITTSBURGH • CHICAGO

American Hoist and Derrick Co. 619
ST. PAUL 1, MINNESOTA

● Please send information on the American Model 410 Diesel Locomotive Crane.

*Name*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

ADDITIONAL INFORMATION

On Any of the Products Mentioned in This Issue

Below is a complete index of the products referred to in both the editorial and advertising pages of this issue. If you desire additional information on any of them, use one of the accompanying addressed and stamped postcards in requesting it. In each case give name of product and page number. The information will come to you directly from the manufacturer involved, without any obligation on your part.

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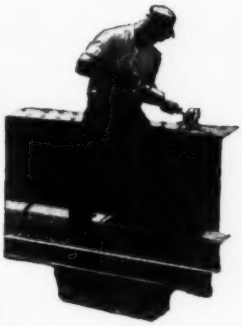

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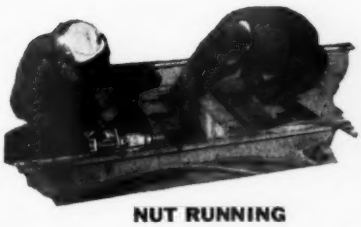

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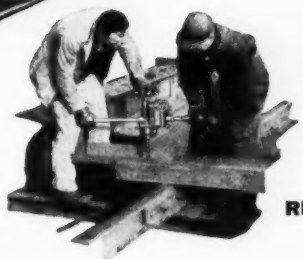

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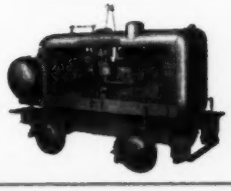

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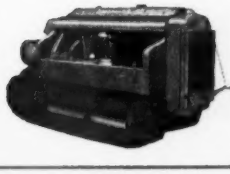

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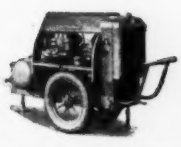

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(PATENT APPLIED FOR)

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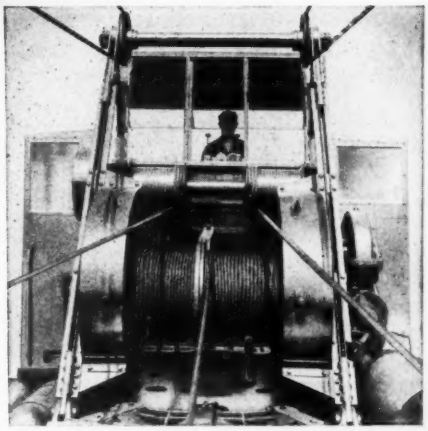
These are only two of the many *money-saving, labor-saving, time-saving* features engineered into the Brownhoist Diesel Electric Locomotive-Crane. Others include the patented Monitor-type cab that affords the operator 360° visibility—travel speeds up to 15 M.P.H.—double disc roller bearing mounted rotating clutches —roller bearing boom tip sheaves—14" safety clearance between car body and rotating bed—safe worm driven boom hoist. Capacities 30 tons and up. Write for complete facts that will show you how to *speed and simplify your material handling at lower costs.*



This view shows how travel clutch shafts and operating gear have been eliminated from the Brownhoist Diesel Electric Locomotive-Crane. Note 360° vision Monitor-type cab with hoist and boom drums in full view of operator.

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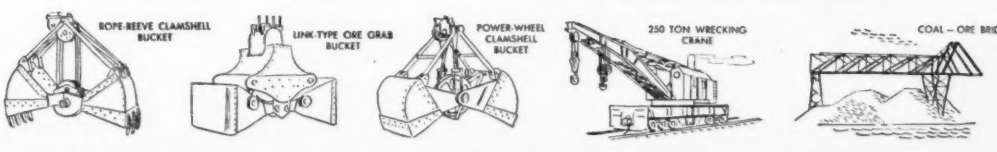

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It's easy to run nuts and apply or remove bolts, studs and lag screws, with a controllable power CP-365 Reversible Impact Wrench (illustrated). Absence of twisting or kickback, and only slight vibration minimizes operator fatigue. Other CP Impact Wrenches from ½″ to 2″ bolt size.

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If you have a railroad yard distribution piping problem, Ric-wiL engineers will be glad to consult with you regarding it—without charge or obligation.

Write for 12 page booklet, Form 4901, featuring recent railroad installations of Ric-wiL Insulated Piping Systems. Address: The Ric-wiL Co., Department 13W.

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Talk about strength—ARMCO Liner Plates really have it. The tough, sinewy kind that is not burdened with excess weight.

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Memorandum to:

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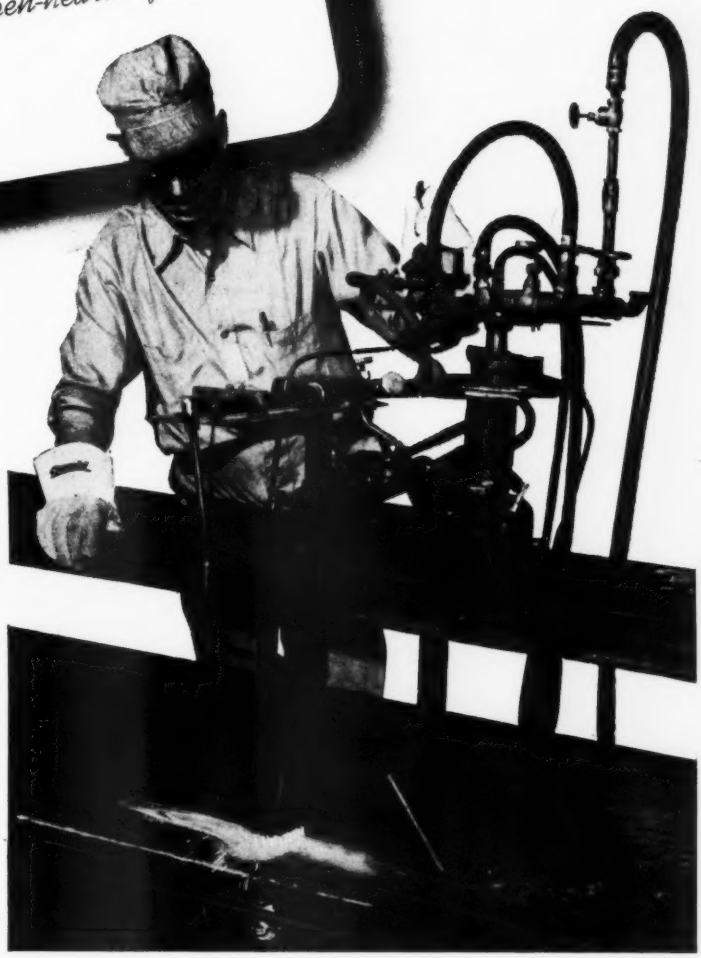
Major savings in track maintenance costs are being made by many railroads that have flame-hardened open-hearth frogs and crossings.



Railroad after railroad follows OXWELD's procedures in constructing simple, efficient frog flame-hardening setups. Thousands of frogs that have been flame-hardened are now in track. These treated frogs are giving far longer service than unhardened frogs — five times longer service and more. This is impressive evidence of the value of OXWELD's flame-hardening process in reducing maintenance costs on frogs and crossings.

Ask your OXWELD representative for details or write for Booklet F 7007 which gives complete information.

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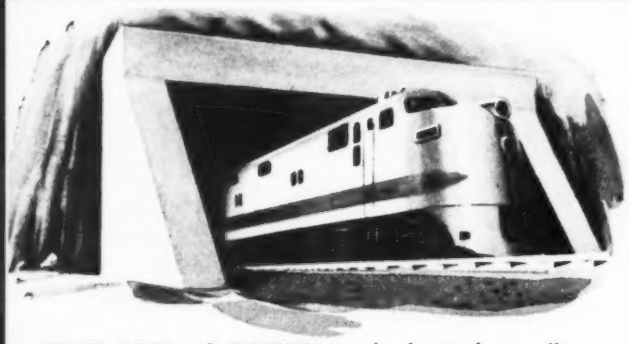
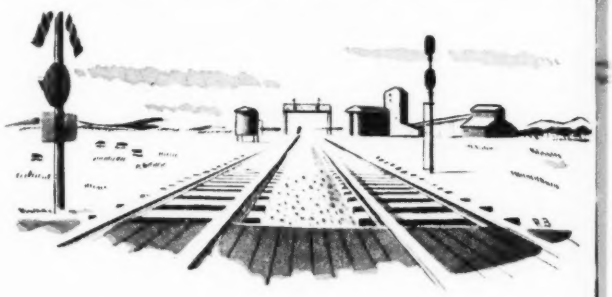
SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

HOW TO STOP EXCESSIVE RAIL

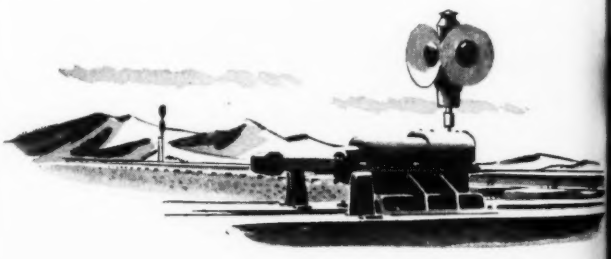


TUNNEL ACIDS and MOISTURE, notoriously rough on rails, cause excessive corrosion and shorten rail life. Now you can protect tunnel track by coating with tough, corrosion-resistant R-M Rail Coating. Especially formulated to resist sulphuric acid fumes and moisture. Won't peel or chip.



GRADE CROSSING PLANKS trap water and winter road salts around rails. R-M Rail Coating protects rails from salt and water, prolongs rail life. Unusual flexibility resists shock and powerful impact of train wheels. Flexibility and adhesion are retained even during severely cold winter periods.

prolong
rail life



WRITE NOW for descriptive brochure and full details of railway field applications and accelerated laboratory tests made with R-M Rail Coating. Included is a review of Rinshed-Mason scientific developments in the field of protective coatings for industry.

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CORROSION-RESISTANT RAIL COATING

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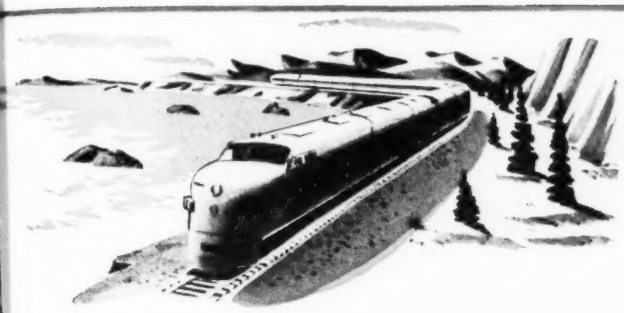

SALT WATER SPRAY bites into track running close to sea shore or salt water areas; cuts many years of life from costly steel rails. R-M Rail Coating resists damaging salt spray; prevents corrosion caused from refrigerator-car brine drippings. Excellent adhesive qualities and abrasive resistance.

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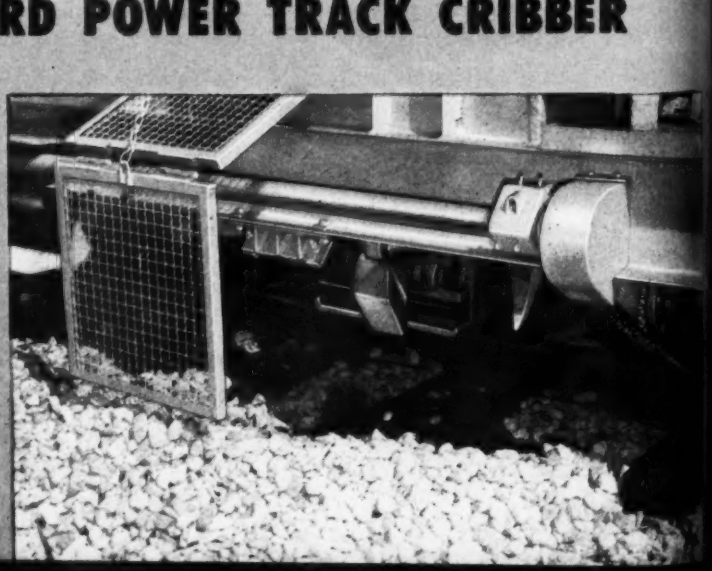
PULLMAN-STANDARD POWER TRACK CRIBBER



● Showing the digger bars and picks when the 6200-pound drophead is in top position ready to start its downward thrust. Digger bars will work the crib to the left while the picks will loosen ballast in the adjacent crib, to the right, as the drophead works on the pile-driver principle.

and-Shovel Gang

WITH BUILT-IN SUPERVISION!

● Now . . . skeletonize track on a machine mass-production basis. The Pullman-Standard Power Track Cribber *automatically* does a perfectly uniform job . . . just the right depth and slope to each crib. It is virtually impossible to duplicate its work with hand-tool methods.

One man operates the Cribber . . . usually two to four men follow to rake out loose material. With this small gang doing the work of dozens of men, you'll measure a day's work in *rail lengths* rather than track feet, or actually two cribs per minute in hard cemented rock ballast. You'll agree . . . this means tremendous savings in man-hours and dollars.

The Power Track Cribber pays for itself. Write today for case histories which prove the actual savings being made by other railroads. See how you too can cut cribbing costs with the machine that is designed to help you solve the man-power problem.

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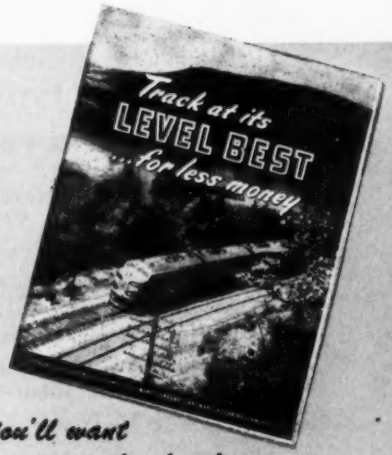
● In their lowest position, the digger bars and picks have moved down and well outward to the ends of the ties. Action is controlled . . . automatically . . . to a uniform depth, the profiles having a uniform slope in all cribs. The drophead rises and falls 30 times a minute, each time with an impact of 173,600 inch pounds! (Screen stops flying ballast.)



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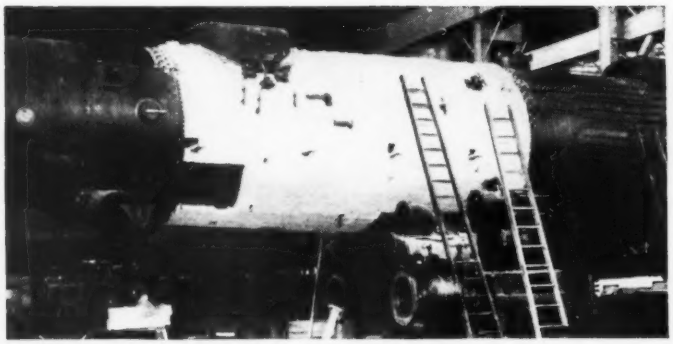
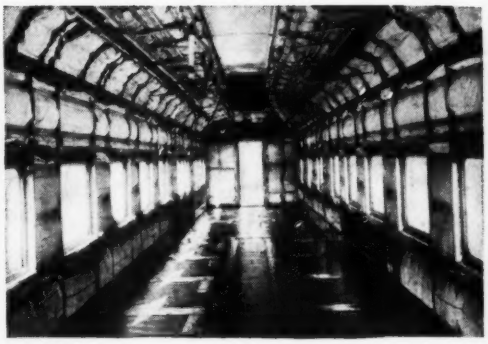
Pullman-Standard will gladly mail a copy of this informative, profusely illustrated 24-page booklet. It tells the entire story of the Power Track Cribber, Ballast Cleaner, and Power Ballaster (tamper) . . . the *complete* mass-production mechanization of these track-maintenance operations for the first time in the history of railroading. Send for your copy today!



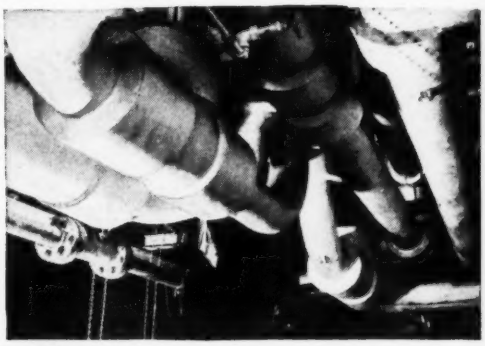
To save on locomotive operation—Use J-M 85% Magnesia Locomotive Boiler Lagging. Combines high insulating value with light weight and the ability to retain its efficiency in service. Furnished in various thicknesses, curved or flat, straight or tapered, to permit snug fit to boiler surfaces.

...there is a type for every railroad requirement...

Johns-Manville manufactures many types of insulations for railroad use...for refrigeration cars, cold-storage rooms, tank cars, air-conditioning systems, locomotive fire-boxes, soundproofing. In addition, the completely equipped Johns-Manville Insulation Laboratories are available to help you find answers to new insulation problems. For further details, write Johns-Manville, Box 290, New York 16, N. Y.



To save on passenger car operation—Insulate with J-M Stonefelt blankets for permanently high thermal insulation efficiency, lower air conditioning costs over the years. Stonefelt retains its rated thickness . . . won't settle with vibration. In addition, it is both fire- and moisture-resistant.



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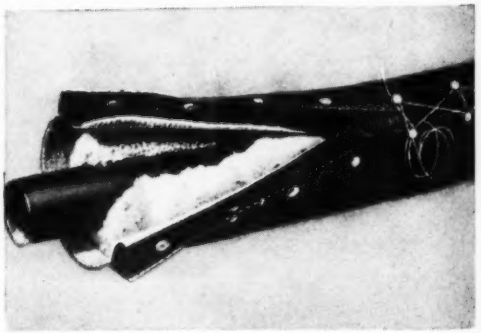

To save on train operation—Use J-M Train-Line Insulations for steam piping, and hot and cold water and air-conditioning lines. Made of materials that maintain high efficiency under severe conditions of moisture and vibration and temperatures up to 450°F.

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91 YEARS OF SERVICE TO TRANSPORTATION

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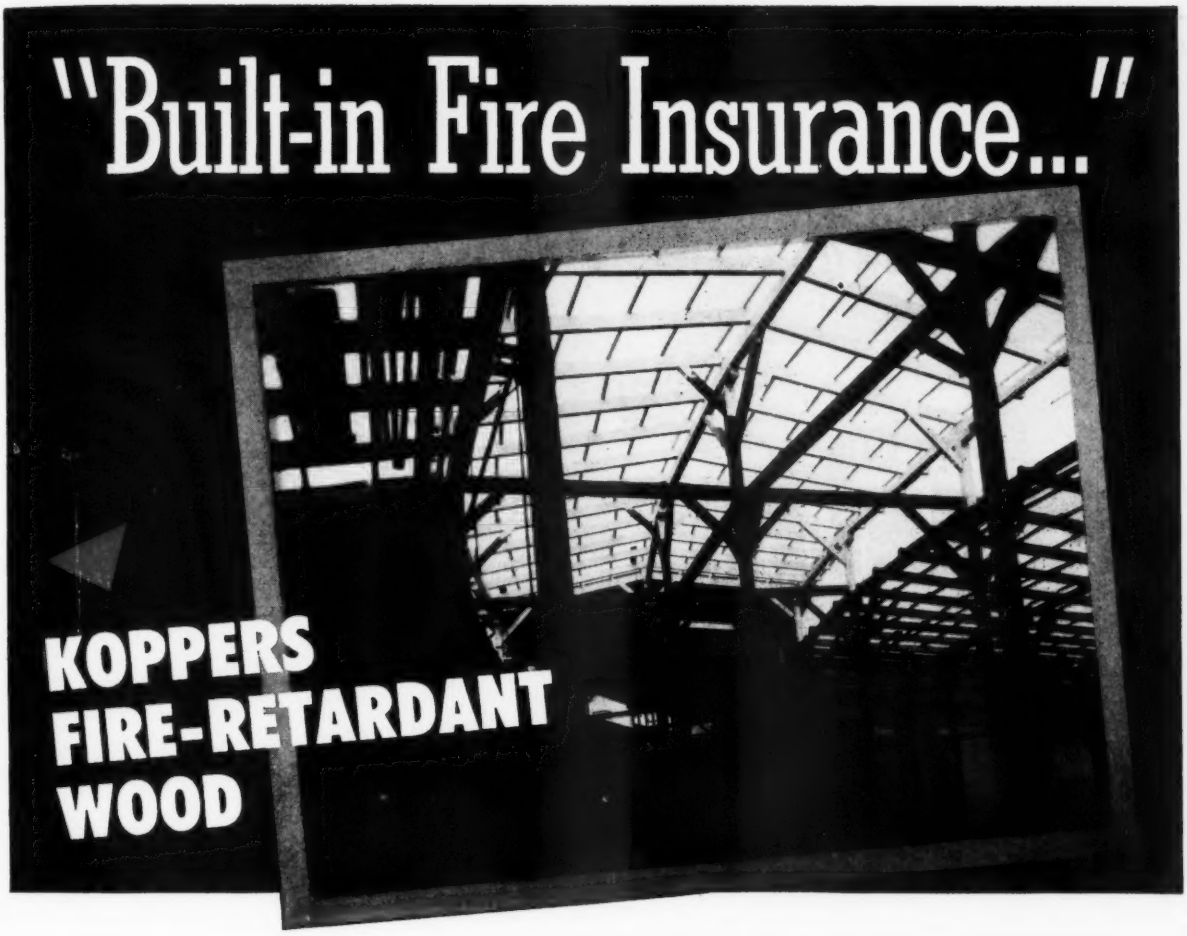

THE effectiveness of Koppers Fire-Retardant Wood has been dramatically demonstrated under actual fire conditions as well as in tests of the Underwriters' Laboratories Incorporated.

In 1946, an explosion at an Ohio magnesium foundry tossed burning magnesium to the top of a fume hood made of Transite on a Koppers Fire-Retardant Wood framework. Although the magnesium burned for ten minutes at about 4000°F., the fire did not spread, and there was no charring beyond the area in direct contact with molten metal. No replacement of Koppers Fire-Retardant Wood because of fire damage was required.

Koppers Fire-Retardant Wood pays dividends even if you never have a fire. To all the advantages of wood . . . its easy workability, availability, decorative value, economy, re-use value . . . are added resistance to decay and termite attack as well as resistance to fire. Yet the odorless Koppers treatment does not harm the color or paintability of the wood. Where treated wood is exposed to leaching, Koppers Flame-Resistant Sealer may be used to seal salts in and moisture out, and maintain a high degree of protection indefinitely.

Koppers Fire-Retardant Wood is ideally suited for the structural members of railroad engine houses, bridges, tunnel linings and for floors, roof trusses, roofing, sheathing and similar applications. Send for a free copy of the booklet, **Koppers Fire-Retardant Wood,** for more complete information about how Koppers Fire-Retardant Wood can protect your buildings.

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

KOPPERS **PRESSURE-TREATED WOOD**

YOU CAN OPERATE BOTH HIGH CYCLE AND STANDARD 110 VOLT TOOLS

with this

HOMELITE

Carryable Gasoline-Engine-Driven Generator

...A WIDE-OPEN FIELD FOR GREATER SAVINGS

HOMELITE PAVING BREAKER

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Because they do more work and weigh less . . . because maintenance costs are cut in half . . . high-cycle tools are being used on more and more construction jobs . . . concrete vibrators, grinders, impact wrenches, chain saws, electric paving breakers and an ever-increasing number of others. They are indeed the last word in greater efficiency.

And here is Homelite's answer to those who want to cash in on the advantages of high cycle tool operation. It's a compact gasoline-engine-driven dual-purpose generator . . . the first and only one of its kind . . . a complete power unit you can pick up and carry to operate your high cycle tools *any place you want.*

NO LOSS ON PAST INVESTMENTS

Even though you have made substantial investments in standard 110 volt tools, you have nothing to lose. For this Homelite Generator operates *both* high cycle and standard universal tools with equal efficiency.

Look into this new Homelite Dual Purpose Generator...the Carryable Power Plant of the Future. Send for bulletin...or, better...let us give you a free on-the-job demonstration. Write, today.

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THE GREEN LIGHT FOR SERVICE

Dependable Track Tools

WARWOOD WORKMANSHIP MAKES THE DIFFERENCE

Tough track tools, such as Warwood makes, expedite maintenance work. Every Warwood Tool is accurately forged, correctly designed and scientifically heat treated to meet A. R. E. A. specifications. There's no job too tough for a Warwood Track Tool. For dependable service, specify and buy Warwood Track Tools.

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WARWOOD TOOL COMPANY, *Wheeling, W. Va.*

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HIGHBALL

WITH OFF-TRACK WORK-POWER

An International UD-9 Diesel crawler with angled blade widens cuts and ditches along the main line of a southern railroad. One man, here, does the work of several gangs—and does it easily, cheaply, efficiently.

Semaphores are up! Tracks are clear while the maintenance work goes on—because reliable International diesel power operates off the rails.

By reducing labor forces and increasing the rate of work performance, International crawler tractors provide the answer to rising maintenance and grade construction costs.

Call in your International Industrial Power Distributor and let him show you how International tractors and power units can serve your needs.

Send for folder, SEMAPHORES UP, for more details on International tractor applications.

INTERNATIONAL HARVESTER COMPANY · Chicago

CRAWLER TRACTORS
WHEEL TRACTORS
DIESEL ENGINES
POWER UNITS

INTERNATIONAL HARVESTER

INTERNATIONAL INDUSTRIAL POWER

Give the "right-of-way" to this LORAIN "*one-man gang*"

★ A tidy, well-drained right-of-way is a sign of good railroad housekeeping. And this new Lorain TL dragline of the Illinois Central will soon have this stretch of track in "apple pie order"— at a fraction of the cost of old pick and shovel methods.

"Workin' on the railroad" provides scores of full time jobs for the Lorain TL today. It's streamlined for railroad service. "Unit assembly" of turn-table assures high efficiency power transmission with simplified design and easy maintenance. Machine may be supplied with a 2-speed crawler, as pictured, or with any of 9 different highly mobile rubber-tire mountings. And, with interchangeable boom equipment, you can work it as a shovel, crane, clamshell, dragline, hoe or pile driver.

But don't worry about keeping the Lorain TL busy. New jobs suggest themselves for this versatile machine — and every one it tackles will result in important time and money savings for you. For complete information, call or write your local Thew-Lorain distributor.

LORAIN FEATURES TL SERIES

- Anti-Friction Bearings
- 5 Identical Shoe Clutches
- 2 Crawler Speeds (Standard)
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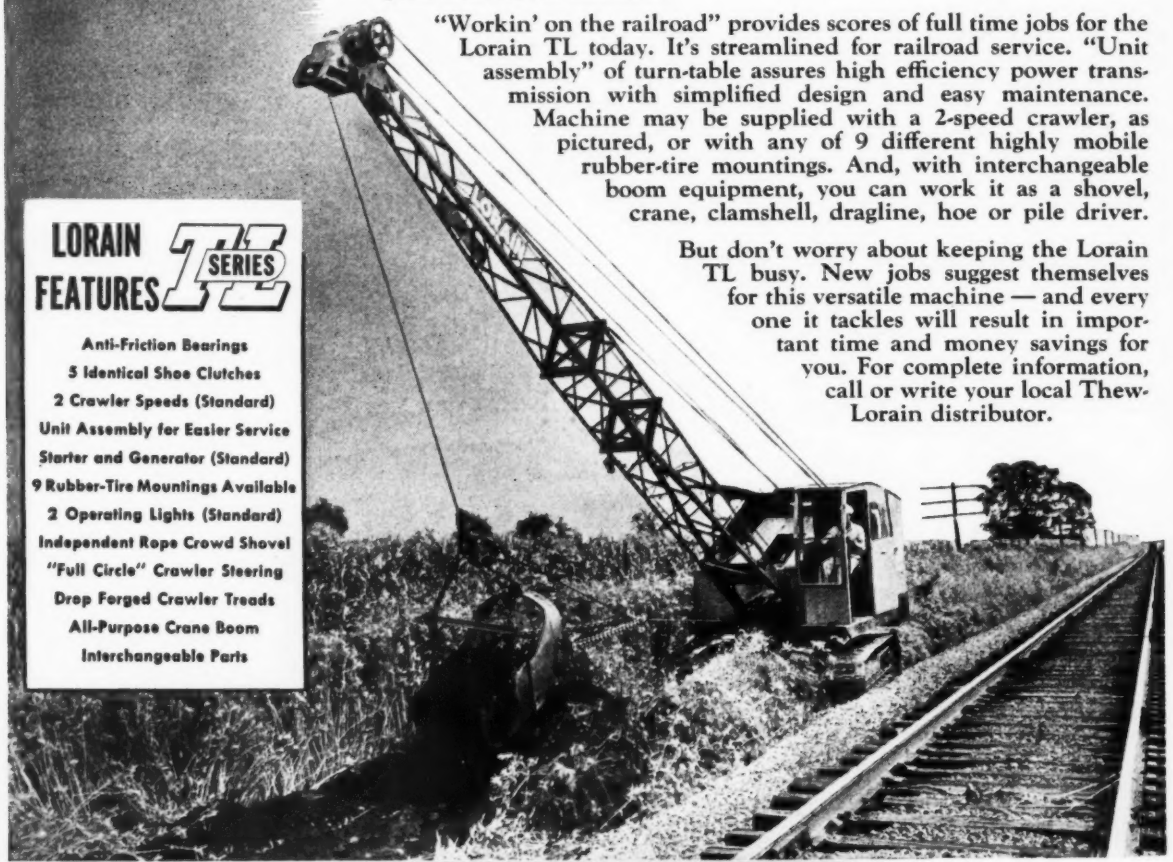
- 2 Operating Lights (Standard)
- Independent Rope Crowd Shovel
- "Full Circle" Crawler Steering
- Drop Forged Crawler Treads
- All-Purpose Crane Boom
- Interchangeable Parts



New Lorain®

THE THEW SHOVEL CO.
LORAIN, OHIO

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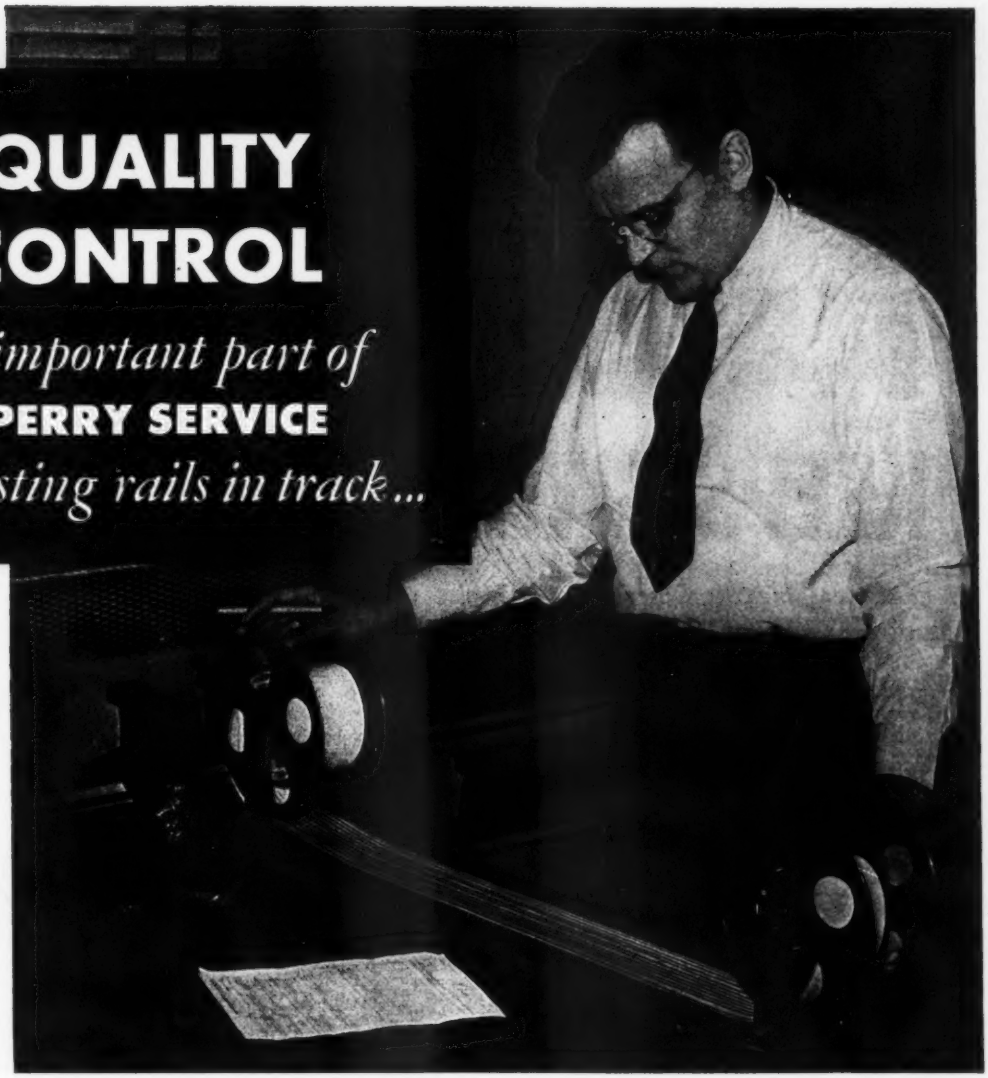
QUALITY CONTROL

an important part of
SPERRY SERVICE
for testing rails in track...



The Quality Control organization of Sperry Rail Service provides important benefits to the railroads, including:

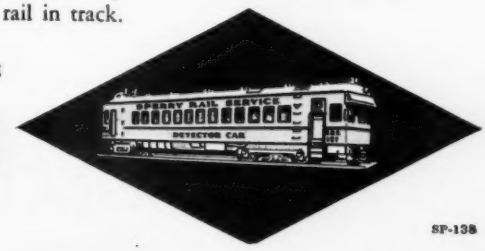
1. **Office inspection and analysis** of test results and service failures by technicians experienced in Detector Car operation and in rail defects.
2. **Field inspection** and analysis of Detector Car performance.
3. **Reports to railroads** and prompt, impartial follow-up of customer problems.
4. **Rail breaking program** in the field, in cooperation with the railroads, to check Detector Car performance.
5. **Recommended improvements** in equipment and operating procedures to the Sperry Operating and Engineering departments.

Quality Control is only one part of Sperry's rail testing service that goes far beyond the actual locating of defects in track. Exclusive "extras" are integral parts of Sperry Rail Service . . . now serving over 100 railroads. Together they contribute to the 20-year Sperry record of finding *more* and *smaller* transverse defects, as well as more longitudinal defects, than any other method of testing rail in track.

Other Sperry Rail Service "Extras"

- COMPILATION OF TESTING STATISTICS
- RAIL DEFECT MANUAL
- SPERRY REVIEW
- INSTRUCTION AND DATA SHEETS
- RESEARCH AND DEVELOPMENT OF NEW EQUIPMENT

WRITE FOR YOUR COPY OF THE SPERRY REVIEW, 1948 STATISTICAL ISSUE



SPERRY RAIL SERVICE

Division of Sperry Products, Inc.
DANBURY, CONN.

SP-138

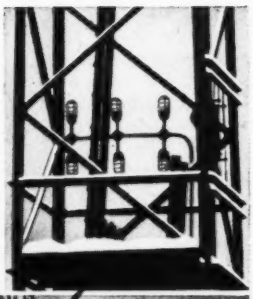
RAILROADERS'

3½¢ AN HOUR FOR POWER KEEPS SWITCHES SNOW-FREE

General Electric Calrod Snow Melters conquer snow easily, economically in B&O yards at Willard, Ohio.

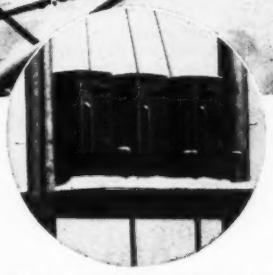
Yes, that's all it cost last winter to operate each of the G-E Calrod heaters that kept 112 switch points clear of snow and ice in the B&O classification yards at Willard, Ohio. These snow melters—part of a 2-million dollar yard modernization program that also included car retarders, power-operated switches, and floodlighting with photo electric control—played a major role in enabling the Willard yards to classify 2,300 cars per day smoothly and efficiently throughout the winter. 38,062 kwh were used at a total cost of $608.99—or an average of 3½ cents per switch point per hour of storm!

If you, too, want to combat snow the easy, electrical way, then get ready for next winter's storms by installing G-E Snow Melters *now!* We'll be glad to help you make a survey for a complete system that meets your needs. For detailed information on G-E Calrod Snow Melters check Bulletin GEA-2719. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



A glance at these indicator lamps tells the control tower operator whether the snow melter circuits are off, on low heat, or on high heat. Snow melters are easily adapted to automatic control, and do not interfere with the track circuits of signals.

G-E Snow Melters are easy and inexpensive to install, require practically no maintenance. They generate and dissipate heat right at the movable point.



Three of the power distribution transformers used by the B&O. These transformers are rated 100 kva, 7200/12470—240/460. Together with another bank of three 200 kva transformers, they provide plenty of capacity for the 850 kw connected snow melter load.

You can put your confidence in—

GENERAL ELECTRIC

DIGEST

News and notes about
GENERAL ELECTRIC products
for the railroad industry

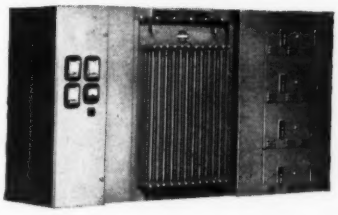
GOOD LIGHTING

speeds after-dark traffic

Darkness needn't mean a slowdown of operations in your yards if you have General Electric's type L-69 floodlights on the job. They put plenty of light right where you need it, eliminate blinding glare and deep shadow—the two most common causes of inefficient night operations. Good yard lighting also makes it easier for retarder operators to see switches, cars, and trackage—helps them judge speed and distance accurately. The L-69 floodlights give you high-efficiency lighting—and at the same time, lower initial, replacement, and maintenance costs. Write for further information.

UNIT SUBSTATIONS

Complete, Ready to Install



General Electric unit substations, in ratings from 2300 volts to 15,000 volts/600 volts and lower, come complete—shipped in two or three sections that are ready to bolt together and connect to power cables. These completely metal-enclosed substations supply power for snow melting, lighting, signaling, and shop purposes. They can be located almost anywhere—indoors or outdoors, often in space that is otherwise not being used. Because these small substations can be located close to the point of power utilization without expensive fireproof vaults, they usually enable you to cut the cost of your electric power system. They mean simplified purchasing—only one purchase transaction is required—and faster, easier installation. For more data check off Bulletin GEA-3592 in the coupon.

The BULLETIN BOARD

Write for your copies NOW!

Four new bulletins that will help you maintain and operate lightning and power equipment easier, at lower cost.

Bulletin GEA-2975D, "Distribution Lightning Arresters." Covers the major points in the protection of distribution systems and describes the features, construction, and characteristics of pellet type lightning arresters.

Bulletin GEA-3448C, "Enclosed, Indicating, and Drop-Out Fuse Cutouts." Describes the applications, features, and specifications of fuse cutouts. Explains how these cutouts solve *all* primary cutout problems.

Bulletin GEA-4521, "High Voltage Distribution Transformers." 500-kva and smaller single-phase transformers that provide unusually high insulation strength and ability to withstand repeated impulse stresses.

Bulletin GEA-3640B, "Outdoor Lighting for Industrial Plants." A new bulletin containing up-to-date information on lighting for loading platforms, work areas, storage areas, roadways, sidings, buildings, fence and protective lighting.

General Electric Company, Section F152-3
Apparatus Department, Schenectady 5, N. Y.

Please send me the following bulletins:

( ) **GEA-2719—Calrod Snow Melters**
( ) **GEA-3592—Unit Substations**
( ) **GEA-3448—Enclosed, Indicating, and Drop-Out Fuse Cutouts**
( ) **GEA-2975—Distribution Lightning Arresters**
( ) **GEA-4521—High Voltage Distribution Transformers**
( ) **GEA-3640—Outdoor Lighting for Industrial Plants**

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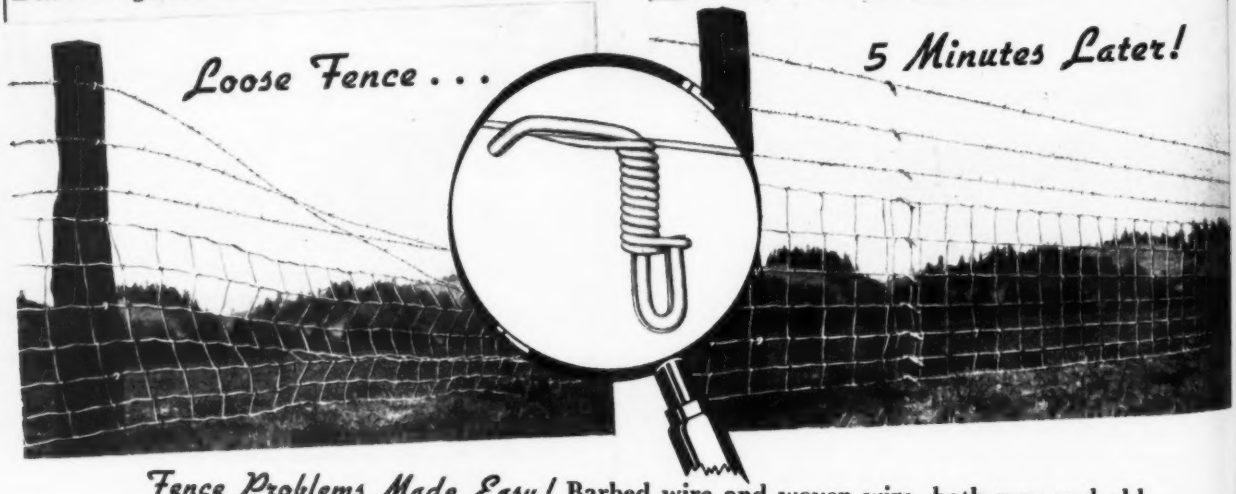
Simple – Effective – Fast

Insert Tightener in Wrench— *Place* over fence wire— *Wind* up slack in wire— *Hook* and remove Wrench



Fence Problems Made Easy! Barbed wire and woven wire, both new and old, are effectively stretched and repaired with this simple method. Slack pulls in with a few turns of the wrench. Since the tighteners stay in the fence, it is a simple matter to retighten your fence at any time for years to come.

Saves time — saves labor! Order now — don't delay!

BENBOW Fence Tightener Co.

BENBOW, CALIFORNIA

Manufacturers of Fence Tighteners for Barbed Wire and Woven Wire Fencing

"CATERPILLAR"

ANNOUNCES A NEW POWER PACKAGE FOR OFF-TRACK MAINTENANCE

Price of a standard D4 Tractor is $4425; No. 4A Bulldozer is $1380; No. 40 Scraper is $2975; No. 44 hydraulic control for use with No. 40 Scraper and No. 4A Bulldozer is $525, f.o.b. Peoria, Illinois, subject to change without notice.

Ideally suited to railroad maintenance is this complete earthmoving package—a "Caterpillar" Diesel D4 Tractor teamed up with a No. 4A Bulldozer and the new "Caterpillar" No. 40 Scraper. It's a tool for big production at low operating cost.

One of its many uses is the drainage job illustrated here. Working on a 500-foot haul, this unit makes 13 trips per hour, loading 3½ cubic pay yards for a total of over 45 yards per hour. It is equally effective in jobs such as daylighting cuts, cleaning out culverts, switch and spur grade construction and winter snow removal. Here are some of its advantages:

1. **Low first cost and low operating cost, coupled with high production capacity.**
2. **An all-"Caterpillar" team with units designed for each other. One manufacturer . . . one dealer responsible for service.**
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4. **Scraper blade designed for grader-smooth finishing.**
5. **'Dozer-type ejection pushes load forward and under the blade, for smooth spreading.**
6. **Rear wheels ride inside the cut—allow work close to vertical banks.**
7. **The 'dozer blade can be angled or tilted to suit all needs.**

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No. 251 of a Series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

79 W. MONROE STREET
CHICAGO 3, ILL.

Subject: Our Questions and Answers

November 1, 1949

Dear Readers:

It is gratifying to know that so many of you read with interest our What's the Answer columns. We know that you do because so many of you say so, often singling out this section for special comment. And it is particularly interesting to know that this interest extends to so many, regardless of age, rank, or years of experience.

At the recent concurrent conventions of the Roadmasters' and Bridge and Building Associations, one of those to mention these columns favorably was one of the younger men in attendance, and another was an old-time roadmaster, who sought me out to tell me that he had been reading Maintenance—and our Questions and Answers—for more than 25 years. Subsequently, in a sort of post-convention session out on the track, three others, including an engineer maintenance of way, a supervisor of work equipment, and an assistant engineer, brought up and discussed our Questions and Answers for more than an hour—a discussion that led to several suggestions for questions, one of which is included among those presented in this issue, to be answered in January.

I suppose there are many reasons for this unusual interest in this section of our publication. Some of these come readily to mind out of my own experience. Just out of school 28 years ago, with my first job on a railroad, one of my earliest companions was Railway Engineering and Maintenance, which I awaited eagerly each month, anxious to learn more about current maintenance problems and their solution. The Questions and Answers section to me then was like a short maintenance course in itself each month, and I soon found myself trying to answer each question—or at least many of them—before reading what the "old heads" had to say.

It is a long jump from those days to the present, but my interest in these questions has never waned in all of these years. Now, from month to month, I look forward with anticipation to reviewing with our What's the Answer? editor, Henry Michael, all of the questions and answers to appear in the next issue. I am anxious to see what old-timers and newcomers are in on the "argument" this month. I want to know what these men—actually confronted with the problems discussed—have to say, and I expect I will always get a special kick out of the differences of opinion that are so frequently expressed.

I wonder if these aren't some of the reasons why so many of you enjoy and value our Questions and Answers. I am sure they are, but let me suggest that you will get still more benefit out of this part of our publication if you will from time to time suggest questions for discussion, and will make it a practice to volunteer answers periodically to those questions which you feel particularly qualified to discuss. With your continued interest and help in this regard, these columns—now conducted for nearly 30 years—can be made still more interesting, can be kept as up to date as your newest problems, and as helpful as current thinking and experience in the field can make them.

Sincerely,

Neal D. Howard
Editor

NDH:ag

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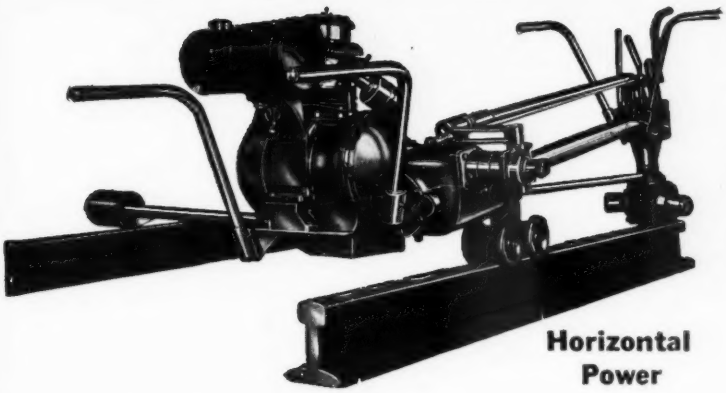

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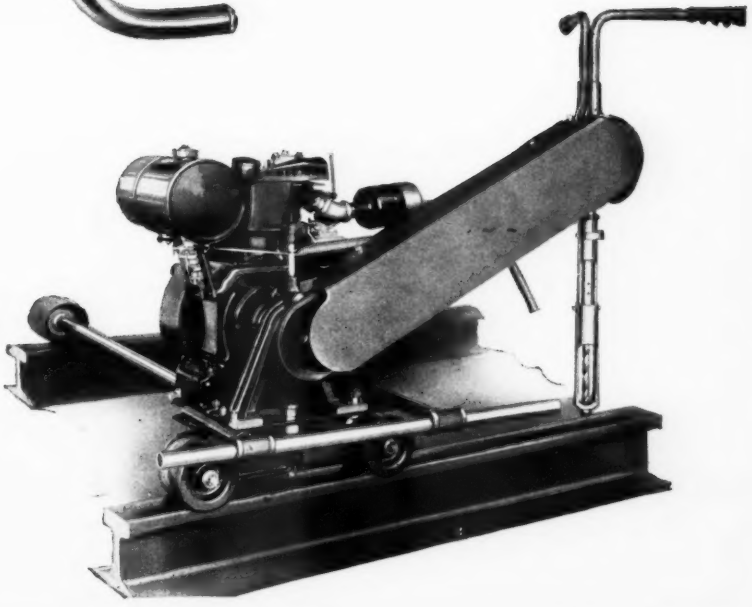

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Fairmont—and only Fairmont—has concerned itself for more than 40 years with the one problem of building better and better maintenance equipment for the railroads of the world. Typical of Fairmont's constant effort to offer ever finer products is the Fairmont Standard Section Car S2, Series H, illustrated here. Simple, rugged and thoroughly dependable, this car has been further improved by engine refinements designed to reduce servicing needs and increase ease of operation. This car has proved itself on hundreds of thousands of miles of service under all sorts of working conditions. In fact it has lent further weight to the famous Fairmont legend—"Performance on the Job Counts." Fairmont Railway Motors, Inc., Fairmont, Minn.

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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

VOL. 45, NO. 11 NOVEMBER, 1949

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"Pick and Shovel" Days Are Over ---- 1071
Opinions expressed by C. H. Paris, which should cause management and maintenance officers to question critically their present practices

Truck Crane Gets High Utility Rating ---- 1073
Tells of the effective use being made of a highly versatile and mobile materials-handling unit on the Chicago, South Shore & South Bend

Reading Promotes Good Housekeeping at Tool Houses ---- 1074
Discusses the annual contests held by this road in the interest of stimulating a greater sense of orderliness on the part of its foremen

Electric Device Tells Gage Conditions ---- 1076
Describes an ingenious device which Track Supervisor J. L. McMillan of the Gulf, Mobile & Ohio has invented and installed on his motor car

Wood Preservation Down 18 Per Cent in 1948 ---- 1077
Presents timber-treating statistics for last year, along with a chart showing the amount of timber treated in various catagories since 1909

New Retort Trams Expedite Tie Handling ---- 1078
Sets forth the features of an innovation recently placed in service by the Forest Products Treating Company at its The Dalles, Ore., plant

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- Disposal of Liquid Waste at Engine Terminals
- Development in Modern Methods For Watering Passenger Coaches
- Methods and Materials for Fire Protection for Bridges and Trestles
- Safety in Transportation of Men and Materials
- Methods of Prevention and Removal of Corrosion from Steel Structures
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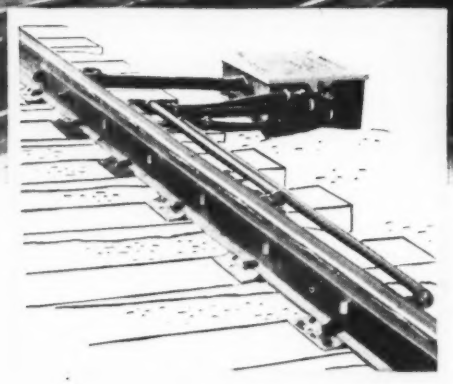

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Productivity —

The Key to Progress and the Well-Being of All

The resurgence of major industrial strikes in recent months is again focusing attention upon the demands of many labor leaders, some of which appear to be made, in the interest of specific groups, with apparent disregard for the welfare of the country, the industries involved, or the public. Sympathetic as one may want to be toward the so-called working man, he cannot close his eyes to the excesses of those who represent labor—excesses which would cripple the industrial life of the nation, with dire consequences for all. To thus comment is not, directly or indirectly, to condone all practices of management, which in some cases may be—indeed, have been—selfish and unrealistic, but it is to say that, through the exercise of monopolistic practices, unreasonable demands, and unjustified work stoppages, labor is doing a grave injustice to the country and the public, and, in the long run, is hurting itself.

It is a long-established, recognized right of labor to organize to protect itself against abuses and injustices, and to promote its general welfare, but some of us are just old-fashioned enough to believe, along with the overwhelming majority of railroad men and the public, we are sure that no organization or group has the right, through its actions, to disregard completely the rights of others—indeed, to jeopardize their health, safety and prosperity—as some organizations and groups are doing today. Furthermore, some of us are just old-fashioned enough to be against all make-work schemes under any disguise, with their wastefulness of the manpower and wealth of the country, and to oppose the claims of something-for-nothing, which are so prevalent in labor circles today. We insist that fairness and the social and economic health of the country, including all of its people—demand full responsibility for acts committed by any group, an honest day's work for a fair day's pay, and a return to the basic philosophy of increased productivity as the only road to greater individual reward and true prosperity. And in all dealings between management and labor, we maintain there must be full regard for existing institutions for meditation and arbitration, with the public welfare paramount always to selfish personal or minority interests.

With these convictions, and never for a moment losing sight of or denying the basic rights and interests of labor itself, we have been opposed to non-contributory forms of insurance and pensions; have been against the claims of railroad brotherhoods for an extra engineer and fireman on Diesel locomotives; have looked upon as wasteful the assignment of extra employees to any task, except to increase safety and production; and have urged increased productivity per man-hour through the use of power tools and machines, and improved methods and planning, as the only sound and feasible pathway to higher earnings and shorter hours.

The magnificient material growth of American industry, and the American railroads in particular, with accompanying higher living standards for labor than to be found anywhere else in the world, have not been the result of restricted production and wasted effort. On the contrary, they have resulted from constantly increasing productivity per man-

hour through improved plant, more efficient methods, and the willingness of all to work. And these same factors alone can lead the way to the future prosperity of both our country and the railroad industry, with the greatest benefit to all.

At the moment, affected by major strikes or threats of strikes, general industrial activity and railroad traffic are on a decline compared with both 1948 and 1947. But with a settlement of present labor unrest on a fair and equitable basis, and a return to the time-tested philosophy of increased productivity through modernization, mechanization, and generally increased efficiency, there is every reason to hope, we believe, that history will repeat itself—that economic conditions in the years immediately ahead will approach or exceed those of the postwar period of 1923-1929, when the welfare of labor, of industry, and of the public generally, forged ahead to unprecedented peaks.

But we repeat our conviction, that this can be accomplished only by emphasis on increased productivity, which alone can provide more to divide, more to distribute in the form of higher wages, lower prices, more money to plow back into business, and a greater yield to the owners of industry.

TUNNEL REPAIRS—

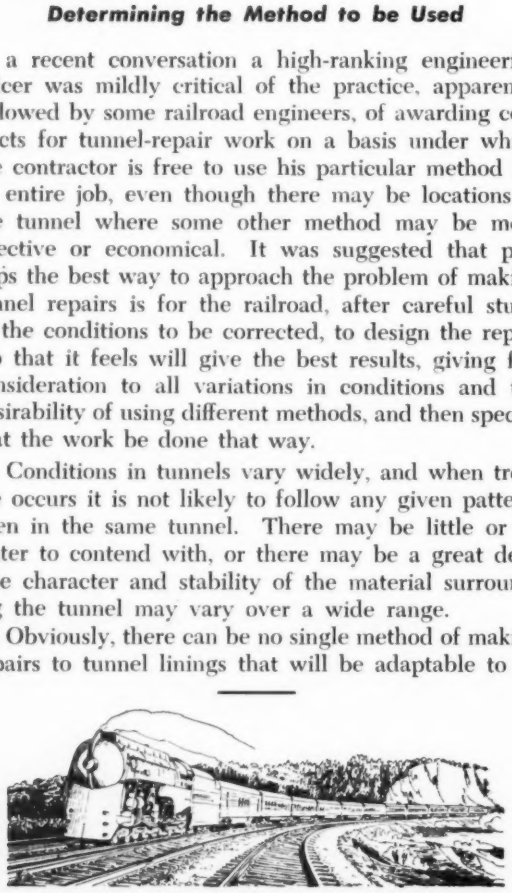
Determining the Method to be Used

In a recent conversation a high-ranking engineering officer was mildly critical of the practice, apparently followed by some railroad engineers, of awarding contracts for tunnel-repair work on a basis under which the contractor is free to use his particular method for an entire job, even though there may be locations in the tunnel where some other method may be more effective or economical. It was suggested that perhaps the best way to approach the problem of making tunnel repairs is for the railroad, after careful study of the conditions to be corrected, to design the repair job that it feels will give the best results, giving full consideration to all variations in conditions and the desirability of using different methods, and then specify that the work be done that way.

Conditions in tunnels vary widely, and when trouble occurs it is not likely to follow any given pattern, even in the same tunnel. There may be little or no water to contend with, or there may be a great deal. The character and stability of the material surrounding the tunnel may vary over a wide range.

Obviously, there can be no single method of making repairs to tunnel linings that will be adaptable to all the different conditions encountered. On the other hand, some of the proprietary materials and methods available for such work are applicable to many situations and have proven highly effective and economical.

A logical approach when considering a particular tunnel-repair problem would seem to be to investigate first the applicability of the various proprietary methods, for when one of these can be used for most or all of the job it usually affords a relatively simple, convenient and economical way of handling the work. If none of these methods is found suitable for all the conditions encountered, then there is no alternative but to use two or more methods, even if it becomes necessary to design special methods to fit the conditions.



FLEXIBLE METHODS—

Open Way for New Machines

Methods of maintaining tracks and structures are constantly improving. Somewhere in the picture when practically every major change in method occurs there is a new machine, looming very large. Did the devising of the new method of work create the need for the new machine, or did the design and manufacture of a new machine make the old method obsolete?

A few years ago, most railway maintenance officers were insistent that roadway machines had to operate off-track. While off-track equipment is recognized as having important advantages under certain conditions, many on-track machines, some of relatively recent development, are being used with highly satisfactory results. It is fortunate, in view of present costs, that either some courageous maintenance men fought for the "detour" system of track maintenance before they had on-track machines to make it as effective as it is now, or that supply companies dared to produce on-track machines that would be efficient enough to break down the resistance to them as a class.

From such experiences maintenance officers have learned that few, if any, of their present methods can be classed as the "last word", but rather as steps toward "better things". Most officers let it be understood, as many have in the past, that their methods are flexible —consistent with working agreements and existing machines—and will be altered, abruptly if necessary, should new and more effective machines be made available.

From this progressive attitude supply men can rightly infer that new machines, if well-conceived, like the "better mouse trap", will be eagerly received even if their adoption requires that drastic changes be made in prevailing methods of doing work. They can be equally certain that new methods will frequently point to the need for new wachines. This leaves the gate wide open for them to design and market the equipment, and presages a continuing improvement in methods of maintenance and in the machine available for this work.

"Pick and Shovel" Days ARE OVER

By C. H. PARIS
Chief Engineer, Retired
Chicago & Illinois Midland

Following a survey of the work equipment situation on a number of roads, and conversations with many maintenance officers on the subject, the author expresses opinions in this article which should cause both top management and those in charge of maintenance operations to question critically their present practices.

• The maintenance-of-way departments of some railways of the country are due for a "rehabilitation job"—have been due for such a job for a long time. Many of them are out of step with present-day demands and have never sold themselves to top management to the extent that now becomes necessary. When any situation has reached the "survival or perish" stage, as it has in the railway industry, it is time to throw ignorance of the situation, prejudices, jealousies, "the way it has always been done", and any and all other inhibiting factors out the window—and for good. It is time to look at ourselves in a full-length mirror.

What are we going to do about the 40-hour week? This question must be answered by some other method than simply payroll reductions. Because a payroll cut is the most direct, absolute, easiest, and certain answer to a required reduction of expenses, it has been used too frequently to this end in the past. Now, with the advent of the 40-hr. week, it is no longer the final answer. There is still work to be done if we are to continue the operation of our railroads. The question, therefore, is not one of expediency or of past practice. Such could only bring temporary relief, at best, without in any way creating a new foundation for permanent levels of reduced costs. It is this latter situation that is of paramount importance now.

To be sure, much has been done toward providing a heavier track structure aimed at reducing maintenance-of-way costs, but why stop so far short of the goal? The advance in motive power and rolling equipment has been rapid during the last decade or more. It has far out-run track maintenance methods and the supplying and caring for such work equipment is essential to low-cost track maintenance.

Need More Work Equipment

A recent survey covering six different railways brings to light numerous factors that point the way to remedies for some of the exisiting causes of hidden maintence-of-way costs—costs that do not appear on the surface or in reports, but which most certainly are there.

In this survey, more than 50 engineers, roadmasters, track supervisors and extra-gang foremen were contacted, either in the office or the field. Without exception, these men were loyal, hard-working, interested employees, trying to do their jobs in the best possible manner. But in most instances they were not able to do their work effectively and economically, and for one principal reason—lack of adequate work equipment. Every man questioned, without exception, said that he could use more work equipment; that he had continually asked for more, but could not get it. Surely, such a situation calls for correction.

If the railroads want more output of work per man-hour, with its resultant decrease in over-all costs, just why do top managements repeatedly turn down requests for the very aids that will bring about this desired result? Is there absence of complete information as to the economics lying behind the request for more work equipment? Is it possible that in this day of machine-power there is prejudice in some quarters against the whole field of such equipment? Has the maintenance-of-way department lacked firmness in its demands, or failed to back them with concrete evidence of what is happening because of the absence of adequate work equip-

Properly balancing gangs with respect to work equipment means maximum production. Three adzing machines, for example, instead of only two for rail gangs may prevent a bottleneck in operations

ment? Whatever the reason, the answer of "No" to requests for adequate power tools and machines to carry out maintenance-of-way operations is decidedly **against** cost reduction.

A power rail drill is one of the least costly of all pieces of work equipment. It will drill a hole for one-tenth of what it costs to do the work with hand equipment. Yet a great scarcity of power rail drills on any railroad makes it necessary to do much hand drilling. It cannot be substantiated that a railroad cannot afford to buy power drills. At present wage rates, it is paying for a power drill with the loss incurred in drilling only a few holes by hand. What is the reason for refusing such equipment to those who are in a position to make real savings with it daily?

Other Present Weaknesses

Then there is the unbalanced gang with respect to work equipment. For example, many rail-laying crews are furnished with only two adzing machines when they should have three. The result is invariably a bottleneck in the operations, with a consequent slowing down of the entire crew of maybe as many as 125 men.

Also, on many roads there is no semblence of an adequate organized force to inspect and service work equipment **before** it breaks down. Yet, it is a well-known fact that preventive maintenance is essential to keep crews operating with maximum production. Crippled operations are not in the interest of low cost. Often, pieces of faulty work equipment are allowed to lie around idle for weeks —costing the railroad real money for no other reason than inattention.

Poor co-ordination between purchasing and stores departments and maintenance-of-way repairmen causes many hidden losses. The inability of roadmasters to authorize and pay for emergency repairs made locally by other than railroad employees, out on the line, results not only in the loss of machine hours, but also of man-hours.

An examination of methods of doing surfacing work on various roads discloses a wide variation in practice. Why? The statements of track men as to the results of these various methods lead one to believe that if only the best were adopted great saving would result.

Then too, there are widely differing opinions as to the value of certain pieces of work equipment. One roadmaster claims that a specific unit of equipment cannot be used effectively. Another roadmaster on the same division, or on another railroad, swears by such equipment, and uses it all the time, with large savings in man-hours.

A cross-sectional view of current practice with respect to the purchase and use of work equipment would lead one to believe that here is a big, practically virgin field for effecting tremendous savings in man-hours. But to effect such savings we must forget past practice and substitute initiative and boldness in adopting radically new policies. Production-line methods can be brought about in the field, but such will require a new kind of managerial skill to coordinate all of the elements involved so that costly delays, traffic interferences and bottlenecks are abolished. This calls for better inter-departmental understanding.

Arbitrary blanket orders that there shall be no overtime by work equipment repairmen may cost a railroad much more than any reasonable overtime required to keep equipment in first-class condition. If repairmen do not get their work out of the way after or before the regular working hours of the track maintenance forces, equipment may have to be taken out of service at the expense of disrupting the entire production line. To avoid overtime, possibly the hours of repairmen can be changed—staggered with the crew hours. But whatever the arrangement, provision should be made for preventive maintenance without the possibility of disrupting the entire working organization. The more attention given to equipment before it breaks down, the less chance that it will break down.

What's Wrong?

There is plenty of work equipment already developed and on the market to effect large cost reductions in maintenance-of-way operations. The trouble is (a) lack of a thorough understanding on the part of many top non-maintenance-of-way executives of the economics involved in **full** mechanization of such operations. This bottleneck results in half-way measures in supplying adequate equipment, and in failure to set up a proper repair and maintenance organization and facilities to service such equipment as is supplied.

(b) Lack of insistence on the part of the maintenance-of-way department upon the use of those proven methods that produce the most economical results.

(c) Lack of detailed study of full mechanization and organization requirements, with the amassing of information that would make it possible to paint the **overall** picture of man-hour savings to management. A few isolated examples are not enough. No management can say that it cannot afford such equipment if it has been fully informed as to the losses which accrue every day that such equipment is not available.

Give Up Pick and Shovel

The "Pick and shovel" days are over. Modern work equipment of today is the pick and shovel of yesterday. Yet, in some quarters, too much emphasis is still being placed on the amount of the investment, with its companions—interest, depreciation and operating costs, and too little emphasis is being given to comparative results, both as to quality and unit costs. Furthermore, in many instances, too much attention is being given to the study of performance reports in the office, and too little time is being spent in the field observing, studying, advising, and correcting mechanized operations to insure production-line results.

The following factors, particularly, require a high degree of supervisory skill and direction: (a) Adequacy of equipment; (b) organization, both as to operation and repairs; (c) condition of equipment; (d) competency of direct supervision; (e) elimination of delays to mechanized operations; and (f) daily production.

The casual, infrequent inspection as often made by the engineer over his territory is no longer sufficient.

Inventory the territory for which you are responsible in line with above. Study your findings. You may be surprised.

Truck Crane Gets High Utility Rating

• The maintenance of way and structures department of the Chicago, South Shore & South Bend finds a constant, wide range of jobs for its truck crane*. It is almost never idle. In fact, the demand for the crane is so great that two men are assigned to it, each trained and qualified both to drive it and to operate it with either a single line or a clamshell. On some work only one man is necessary, but on other types both are required.

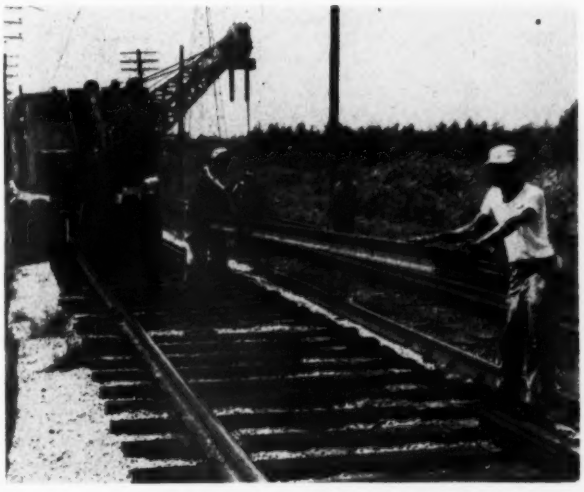
Laying rail comes under the latter catagory, and all rail that is laid on the South Shore is handled by the truck crane. Generally this work is performed by the crane moving along the right-of-way adjacent to the track. However, where the right-of-way is too swampy, too sandy or not level enough to permit easy movement of a heavy, rubber-tired vehicle, the operator retreats with the crane to the stability of the track, where it can be driven over the ties with ease.

In a recent routine rail laying operation, the crane had set in by mid afternoon as many rails as the extra gang could lay, gage and fasten down by quitting time. Seconds after the last rail was set in place the crane had been moved over the running rail, aided by two wood blocks placed on each side of it, and was on its way to unload by clamshell a car of cinders placed on a siding several miles away. Such maneuverability not only minimized the unproductive time of the two operators and accomplished two jobs, but released a steel gondola for revenue service and reduced per diem payments on a foreign car.

The South Shore's truck crane demonstrates it's utility in a similar manner almost daily. While unloading frogs and switch material at a storage point, it may be called upon to run five miles to clear the tracks of the remains of an auto that has run into the side of a local freight. On the other hand, it may be unloading wheels at the car shop when a track department emergency requires it somewhere else. Even though such varied demands may often disrupt well-laid plans, it is said that the crane's speedy mobility permits it to cover all types of work on the 78-mi. electric line with complete satisfaction.

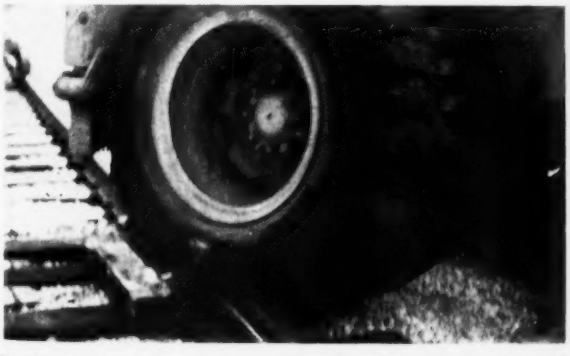
*Manufactured by the Michigan Power Shovel Company, Benton Harbor, Michigan.

Above—The Chicago, South Shore & South Bend's utilitarian truck crane moves over the ties setting in rails, then . . .



. . . with one pair of rear wheels on the ballast, places the closure rail to finish the job, and a few minutes later . . .

. . . has moved five miles away from the rail-relay job to unload by clamshell a car of cinders set out on a spur track



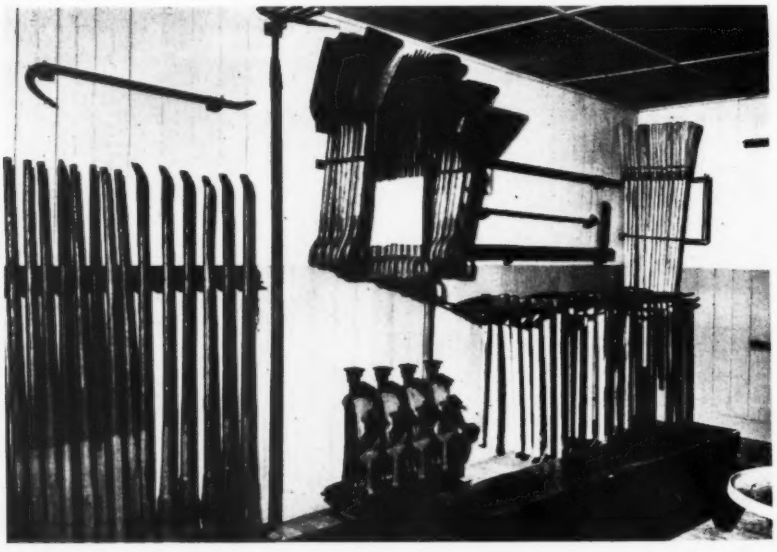
Dual wheels easily move over rail with aid of two wood blocks

Reading Promotes

Anthony Battista, foremen at Park Junction, Philadelphia, Pa., whose tool house was chosen as the best on the Reading, feels that tool-house improvements have resulted in better morale

For several years the Reading has been stimulating among its section foremen, through an annual system-wide contest, an interest in good housekeeping at section tool houses in the belief that such a program not only results in improved conditions at the tool houses, but will extend to other phases of the foremen's daily work. The results of the 1948 contest, together with the opinions of the road's engineer maintenance of way and three of the winning foremen appear in this article.

Above—Interior view of the tool house at Park Junction, showing the benches used by the men during lunch periods when working near their headquarters. Below—Neat tool racks in the Park Junction tool house, made by local welder, permit the gang to live up to the motto: "A place for everything and everything in its place"



• For the past several years the Reading has undertaken to create greater interest on the part of its section foremen in being good housekeepers—particularly at section tool houses—in the belief that a sense of orderliness is a fundamental characteristic of an efficient foreman. As a means of furthering this policy, and to develop a spirit of competition among the men in the section forces, this road conducts an annual contest to determine the best-kept tool house on each track supervisor's sub-division, on each operating division, and on the entire system.

How Contest is Conducted

During the year the various track supervisors on the Reading make frequent inspections of the tool houses on their respective sub-divisions, and near the end of the year each selects a winner for his sub-division. An attractive metal sign, reading "Best Tool House on Sub-division.....," signed by the supervisor, is given to each winning foreman. These tool houses are then inspected by the superintendent and division engineer of each division, who select winners for their respective divisions and award appropriate signs.

A committee of system officers, including the general manager, the manager of stores, the engineer maintenance of way and the engineer of tests, then inspects the division winners and chooses the outstanding tool house on the entire

Good Housekeeping at Tool Houses

road. Again, an appropriate sign is awarded for attaching to the tool house.

According to M. S. Miller, engineer maintenance of way, Philadelphia, Pa., the contests have not only resulted in a general improvement in tool houses, but have also raised the standard of those foremen who were lagging in the program, by inspiring them through the example of the prize tool houses.

Mr. Miller goes on to say that the Reading encourages the foremen to install suitable racks for tools and to provide shelving for small items, such as track bolts, so that they may be located readily when needed. The assistance of welders and carpenters has been made available for such work. "Placing the tools in racks," he states, "makes it easy to discover those that should be scrapped and to detect those which require repair to assure safety in their use."

Foremen's Viewpoints

In the 1948 contest, the tool house of Anthony Battista, foreman at Park Junction, Philadelphia, was selected as the best on the Philadelphia division, and on the entire Reading system as well. Giving full credit to his men for their part in winning the award, Mr. Battista believes that the improvements at the tool house have done much to improve the morale of his men. As an example, he cites the steel lockers now provided for each man in the gang, which enables the men to wear street clothes to and from work, and to change at the tool house. This, he believes, is important in developing a greater feeling of self-respect in the section laborer.

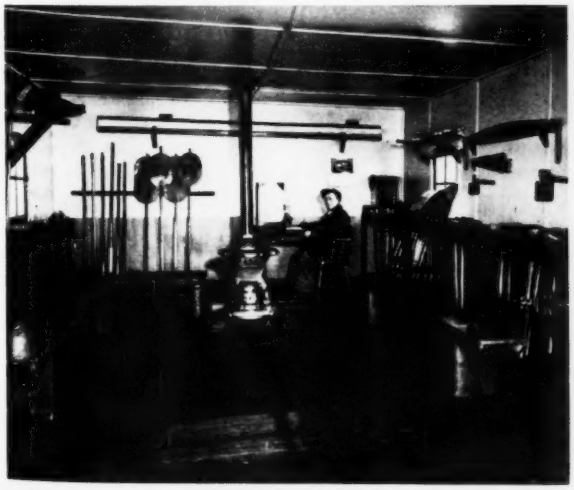
Michael Bojaick, foreman at Auburn, Pa., whose tool house was selected as the best on the Shamokin division, endorses Mr. Battista's comments, adding that his men take pains to keep the tool house clean and orderly, being careful to restore tools to the proper rack at the end of the day. This orderly habit, he feels, also extends to their work out on the road, promoting safety on the job and resulting in increased production.

Another prize winner—Harry E. Imbody, foreman at Green Lane, Pa., on the Reading division—feels that the inspections of the tool houses promote closer personal contact between the section forces and the higher maintenance officers, enabling the men to "know the bosses", the result being improved relations between employees and management. He believes that training in the keeping of orderly tool houses "makes things work out more easily for us in the performance of our duties." In other words, he says, "we have learned that good housekeeping and good work go hand in hand."

Would Continue Contest

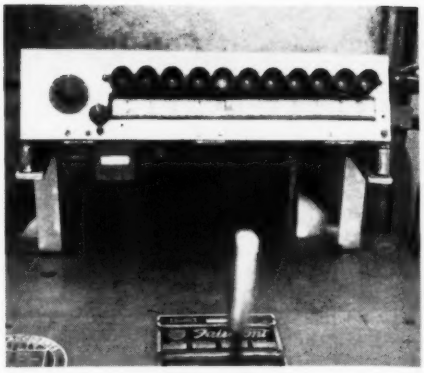
With regard to the benefits of this program to the railroad, Mr. Imbody goes on to say that it keeps the foreman "on their toes", causing them to work more efficiently and safely. Like the other prize winners, he points out that, "We have learned not only to keep our tool house orderly, but to keep the right-of-way and the entire physical property in the same condition." He adds that he is "whole-heartedly in favor of continuing the contest because of the good results it brings."

Summing up his ideas on the benefits of the contest, Mr. Miller states: "The enthusiasm created in the contest to improve all tool houses has had several effects in addition to making good housekeepers of our foremen. Of great importance is the general improvement in morale. Also, the tendency toward good housekeeping is noticeable in all phases of railroad work where they have responsibility, all of which benefits railway operation and management."



Michael Bojaick, foreman at Auburn, Pa., makes out reports in the winning tool house of the Shamokin division of the Reading

Harry E. Imbody, winner on the Reading division, is "wholeheartedly in favor of the contest because of its good results"



Left—Rear view of Mr. McMillan's Fairmont inspection car, showing gage-measuring wheels lowered to the rails. Above—Close-up view of the light panel. The larger dial to the left of the lights is the selector for the bell system and the smaller dial is the switch. The box projecting below the panel is the counter

ELECTRIC DEVICE Tells Gage Conditions

Track Supervisor J. L. McMillan of the Gulf, Mobile & Ohio, has invented and installed on his motor car an ingenious device which picks up all variations in the gage of the track over which the car is moving and indicates them by an automatic system of lights and bells.

• Keeping a close and accurate check of track gage conditions on his territory is a simple matter for J. L. McMillan, track supervisor, Gulf, Mobile & Ohio, Springfield, Ill. He has invented and installed on his Fairmont inspection motor car an electrical device which, as the car moves over the track, flashes colored lights in such a way that all variations in the gage of the track from true gage can be read at a glance. Also a bell on the device rings whenever any preselected variation in gage is encountered by the car, and, if desired, the number of times any pre-selected gage variation is found along a section of track can be counted automatically. Thus, as Mr. McMillan travels over his territory, he gets both a visual and auditory check on gage conditions without having to stop his motor car.

The visual gage indicator, which is located at the front end of the car, about 12 in. above the seat, consists of 11 colored lights arranged on a panel in a row above a scale on which variations in track gage are marked in ⅛-in increments from ½ in. tight gage to ¾ in. wide gage. The light indicating true gage is yellow. The various increments of wide gage are marked by six red lights located to the right of the yellow light, and those for tight gage by four green lights to the left of the true gage light. Thus, when the device is in operation and the car is moving, the lights flash back and forth along the panel, indicating all variations in gage. If a light flashes to indicate a point in the track where the gage is so tight or so wide as to require attention, the car can be stopped and backed up, and the point quickly located exactly.

The auditory system is operated by a relay and selector. The selector has 11 different settings to correspond to the 11 different gage variations marked by the lights, and will cause a bell to ring, either intermittently or continuously, at any desired setting. If, for example, the selector is set for ½ in. wide gage, the bell will ring each time the car passes over a point in the track where the gage is ½ in. wide. At the same time the counter can be cut in to record each time the bell rings. Mr. McMillan intends to install additional counters on the device so that he will be able to tell at a glance the exact number of times each of the various gage readings occur in any stretch of track.

The mechanism which measures the track gage and which contains the electric switch system that activates the lights and bell, consists of two small flanged wheels with an axle between them, towed behind the motor car. The axle is coupled to the motor car in such a way that no lateral motion of the car is transmitted to the axle. The flanges of the wheels are vertical and press against the gage sides of the rail heads. When it is not desired to observe gage conditions, the wheel and axle assembly can be lifted vertically off the track by a lever and locked in a raised position.

The wheel at one end of the gage measuring assembly is keyed to the axle while that at the other end is free to move laterally. At the latter end there is a coil spring between a shank on the axle and a bushing next to the wheel, which keeps the wheel flanges pressed against the rails at all times. Thus all variations in the track gage cause a lateral movement of the

wheels with respect to one another.

The switch system for actuating the lights consists of 11 contacts, one for each light, spaced ⅜ in. apart along an arc, and a pivoted switch arm. The end of the switch arm below the pivot point is connected to a rod leading to the bushing at the free wheel. This bushing is keyed to the axle in such a way that, while it cannot turn with the wheel, it is free to move laterally. The switch arm, together with the rod from the bushing, form a lever arrangement that multiplies by three any lateral movement of the wheels. In other words, each ⅛-in. lateral movement of the wheels causes a ⅜-in. movement of the contact end of the switch arm to correspond with the ⅜-in. spacing of the contacts. The contacts are connected to the lights by a cable. The current for operating the device is furnished by six dry-cell batteries.

Wood Preservation Down 18 Per Cent in 1948

• The wood-preserving industry treated 292,357,303 cu. ft. of wood in 1948, according to the annual report compiled by Henry B. Steer, Forest Service, United States Department of Agriculture, in cooperation with the American Wood Preservers' Association. This was about 18 per cent lower than the 356,587,809 cu. ft. treated in 1947, and only 19 per cent under the largest amount ever treated—recorded in 1929.

Crossties constituted more than 42 per cent of all the wood given preservative treatment during 1948, continuing a record, unbroken since 1909, of being the largest class of material given preservative treatment. The number of crossties treated—41,158,744—was 6,783,708 less than were treated in 1947, but 6,134,992 more than the number actually laid in replacement by all Class 1 roads during 1948.

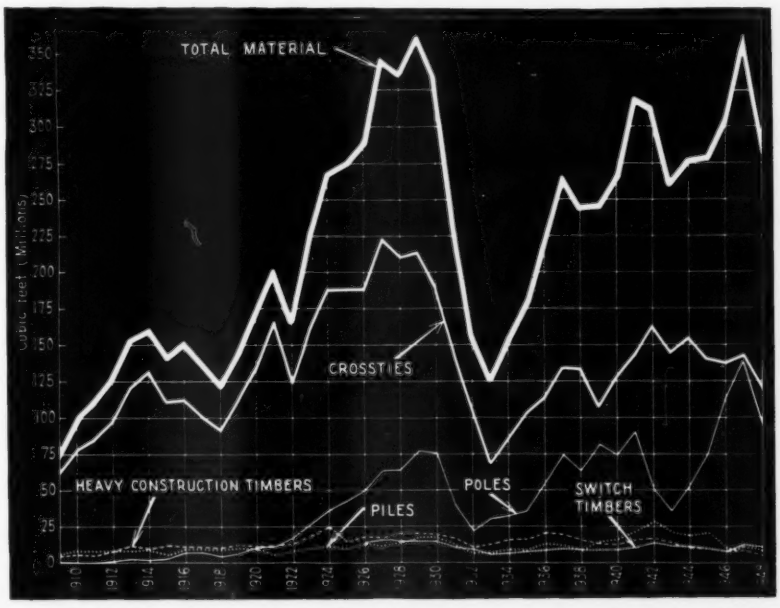
Approximately 66 per cent of all crossties given preservative treatment in 1948 were treated with creosote or creosote-coal-tar solution, and almost 34 per cent with creosote-petroleum solution. The remainder—less than one per cent—were treated with miscellaneous preservatives, including petroleum-pentachlorophenol solution, creosote-petroleum - pentachlorophenol solution, chromated zinc chloride, and Wolman salts. No crossties were reported as treated in 1948 with creosote petroleum copper naphthenate. These figures show an increase of about 11 per cent each in the number of ties treated with creosote and creosote-petroleum solutions.

According to the forest service report, "the number of crossties reported treated by the several plants as 'mixed hardwoods', or some similar designation, has increased to such an extent that it is no longer possible to distribute the quantity so reported to individual species with a reasonable degree of accuracy."

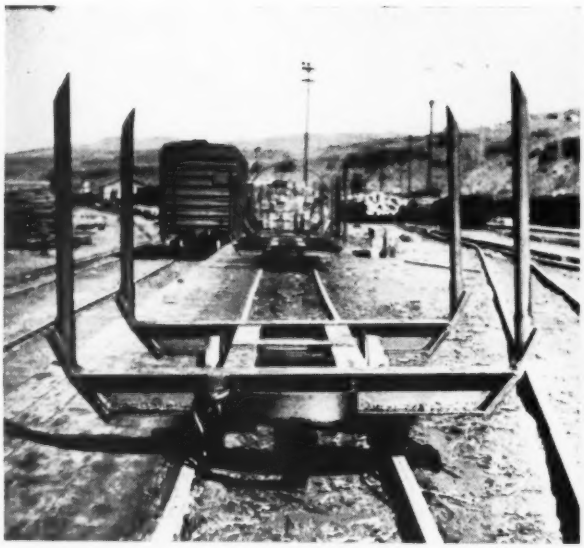
The volume of switch timber treated during 1948—11,556,295 cu. ft.—almost equaled the amount treated in 1947, the difference being less than 40,000 cu. ft. The quantity of switch ties treated with creosote or creosote-coal-tar solution was 12 per cent greater than the amount treated in 1947, and the amount that was treated with creosote-petroleum solution decreased by about the same percentage. This reversed the conditions pertaining at the end of 1947 when the amount treated with creosote had decreased and that treated with creosote-petroleum solutions had increased.

The quantity of wood given fire-retardant treatment in 1948 was 9,597,787 ft. b. m., or 90 per cent more than was reported in 1947. This treatment required the use of 1,582,437 lb. of dry chemicals, including chromated zinc chloride, Protexol and Minalith.

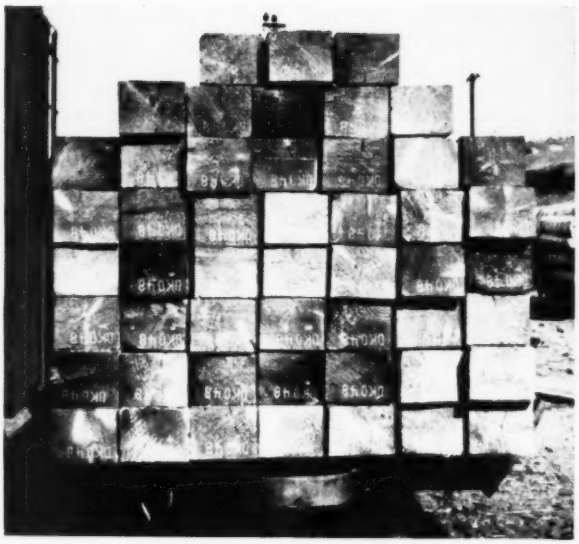
During 1948 the wood-preserving plants reported a consumption of 197,418,497 gal. of creosote and creosote-coal-tar solutions. This was a decrease of 18,397,380 gal. from the quantity reported in 1947. In the same period the consumption of creosote-petroleum solutions decreased 27,625,442 gal. below 1947 figures to a total of 54,888,365 gal. Decreases were reported in other preservatives, including zinc chloride, celcure and pentachlorophenol and a sharp drop was reported in copper naphthenate, the use of which slipped to a mere 31,755 lbs. On the other hand chromated zinc chloride and Wolman salts increased in use during 1948.



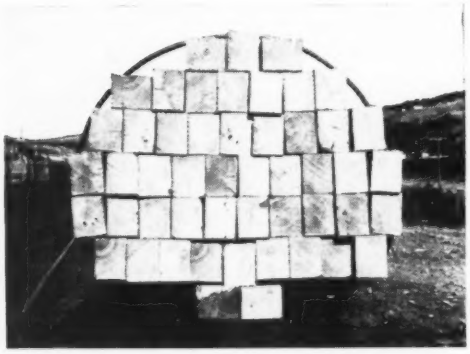
A graphic record of the volume of wood treated in various categories since 1909



Showing the construction of the new Forest Products' Trams



End view of a 50-tie load on one of the new retort trams



A 50-tie load on one of the old-type retort trams

New Retort Trams Expedite Tie Handling

• The Forest Products Treating Company has placed in service at its treating plant at The Dalles, Ore., a new type of retort tram designed to carry a load of ties in a package which has a flat bottom and vertical sides. When a load of ties arranged in this fashion is lifted as a unit from the tram by a sling and deposited on a storage pile or in an open-top car, as is done at The Dalles plant by both a locomotive crane or a hammerhead crane, the entire unit remains intact; no scattering occurs. As a result, the large amount of hand straightening and restacking of ties formerly required in these operations has been reduced appreciably.

To achieve the new load shape, neither reduction in load capacity nor alterations of the retorts was necessary; the new tram carries fifty 7-in. by 9-in. ties (the same number as the old) and fits, with its load, into the existing retorts, which are 7 ft. in dia.

The 50-tie load carried on the old tram was approximately circular in cross section to approach as closely as possible the clearance line inside the retort, the object being to get a maximum load. The bottom layer of the load consisted of two ties placed longitudinally between the pairs of wheels in a pocket just above the axles. When a load of this form was deposited, after being lifted as a unit from the tram, the two bottom ties caused the top ties to roll apart and scatter. Thus before the next sling load could be deposited, a considerable amount of hand labor was required to straighten and restack the ties.

Another objectionable feature of the old trams used at The Dalles plant, which has been eliminated in the new tram design, is the necessity of using bails to secure the load. To avoid convergence of the two pairs of horns, or posts, provided at the sides of the old trams, a condition which would confine the load so that it could not be lifted from the tram as a unit, these posts were restricted in height, extending only to a point somewhat above the center line of the retort. It was customary, therefore, when using this type of tram, to bind the load with a bail at each end. Before the tram could be unloaded, these bails had to be removed, which was a time-consuming job.

The new tram consists of a welded steel frame mounted on four 12-in., Timken-bearing equipped wheels, with 3-in. square axles.

The longitudinal members of the frame are 5-in. and the transverse members 6-in. WF rolled beams. Welded to each corner of the frame is a short socket of standard 2½-in. pipe. Into these sockets are fitted removable, interchangeable posts of extra-strength 2-in. pipe, with beveled ends. When the side posts are removed, the sides of the load are exposed, a feature which expedites unloading operations materially.

The Forest Products Treating Company has been using a number of these new trams since the spring of 1947, and expects to have more than 200 of them in service by the end of 1949.

Bridge and Building section

New and Old Problems Studied at Chicago

Much territory was covered by eight technical committee reports presented at well-attended fifty-fourth annual meeting of bridge and building group

New ways are constantly being developed to deal with existing problems in the maintenance of railway structures, and new problems are constantly arising to challenge the ingenuity of bridge and building supervisors. The truth of these two observations was emphasized time and again during the presentation of eight technical committee reports before the fifty-fourth annual convention of the American Railway Bridge & Building Association, which was held at the Stevens hotel, Chicago, September 12-14.

The Bridge & Building convention, for the fourth consecutive year, was held concurrently under the same roof with the annual meeting of the Roadmasters' and Maintenance of Way Association. A complete report of the Roadmasters' convention, including reference to a number of sessions and other activities in which the two groups participated jointly, was published in the October issue.

As explained in the story of the Roadmasters' meeting the two conventions were convened in a joint session on Monday morning, September 12, which was directed jointly by E. H. Barnhart, division engineer, Baltimore & Ohio, and president of the Bridge & Building Association, and R. L. Fox, division engineer, Southern, and president of the Roadmasters' Association. Mr. Barnhart, assisted by W. F. Martens, supervisor of salvage, Atchison, Topeka & Santa Fe, and first vice-president of the association, presided over the separate sessions of the Bridge & Building group.

The principal address at the joint opening session was delivered by J. H. Aydelott, vice-president, Operations and Maintenance department, Association of American Railroads. At two subsequent joint sessions the two groups heard addresses on the 40-hr. week by F. S. Schwinn, assistant chief engineer, Missouri Pacific lines in Texas and Louisiana, and president of the American Railway Engineering Association; on the subject, What Now? You Can Help, by C. J. Geyer, vice-president, construction and maintenance, Chesapeake & Ohio; and on Personalizing the Safety Concept, by C. M. Kimball, assistant to vice-president (safety), Southern System. The address by Mr. Schwinn was followed by a panel discussion in which the speakers consisted of C. M. Chumley, engineer maintenance of way, Illinois Central; G. L. Sitton, assistant chief engineer, Southern System; and A. A. Cross, engineer maintenance of way, New York, New Haven & Hartford. Abstracts

President Barnhart leading a session

Convention Pictures

On the following pages are presented photographs snapped in the Stevens hotel during the Bridge & Building and Roadmasters' conventions. Additional pictures taken during the meetings appeared in the October issue.

of all the addresses presented during the joint sessions were published in the October issue.

There was no manufacturers exhibit at the conventions this year, but the Track Supply Association and the Bridge & Building Supply Men's Association, the exhibit-sponsoring organizations at these meetings, collaborated in putting on display in the corridor of the convention floor the photographic exhibit of railway engineering progress that was originally shown at the Golden Anniversary convention of the A. R. E. A. last March. The exhibit was loaned for this purpose by the National Railway Appliance Association. Also, the Track Supply Association and the Bridge & Building Supply Men's Association gave a banquet on Tuesday evening for the railroad men attending the two conventions, and their families at which 1,000 persons were served.

General speculation in advance of the conventions was that the lack of an exhibit would be reflected in a considerable drop in the attendance as compared with previous years. However, the drop was not nearly as serious as was anticipated in some quarters. A total of 808 members and guests registered at the two meetings. While this was somewhat under the peak registration of 900 members and guests at the 1948 meeting, it was considerably higher than the comparable figures for 1946 and 1947, the other two years during which the two conventions were held concurrently.

An address by President Barnhart was the opening feature of the first separate session of the Bridge & Building group. Confining his remarks largely to the affairs of the association, Mr. Barnhart explained that the practice inaugurated at the 1948 convention of selecting during the meetings the subjects to be studied the following year, permitting early selection of the committee chairmen and members, had proved highly satisfactory. Then, explaining how the active membership of the association has been brought back from a "low ebb" at the close of the war, he presented figures showing that the total membership in the association was 676 on August 31, or 24 members more than on the same date last year.

Following Mr. Barnhart's address the group tackled the principal business of the meeting, which consisted of the presentation and consideration of eight committee reports on the following subjects; Installation and Maintenance of Built-Up Composition Roofs; Safety in Transportation of Men and Materials; Methods and Materials for Fire Protection for Bridges and Trestles; Prolonging the Life of Ties on Bridges and Trestles; Methods of Preventing and Removal of Corrosion from Steel Structures; Disposal of Liquid Waste at Engine Terminals; Modern Methods for Watering Passenger Coaches; and Pier Construction and Maintenance of Waterfront Terminals.

In the election of officers at the final business session Mr. Martens was advanced to president; W. A. Huckstep, general building supervisor, Missouri Pacific, was promoted from second vice-president to first vice-president; Guy E. Martin, superintendent water service, Illinois Central, was advanced from third vice-president to second vice-president; F. R. Spofford, assistant division engineer, Boston & Maine, was promoted from fourth vice-president to third vice-president; Lee Mayfield, resident engineer, Missouri Pacific Lines, Houston, Tex. was elected fourth vice-president; and L. C. Winkelhaus, architectural engineer, Chicago & North Western, was re-elected treasurer. Directors elected were: F. M. Misch, general bridge and building supervisor, Southern Pacific; L. R. Morgan, fire prevention engineer, New York Central; and

W. F. Martens
1st Vice-President

W. A. Huckstep
2nd Vice-President

G. E. Martin
3rd Vice-President

F. R. Spofford
4th Vice-President

Bridge and Building Association

Officers, 1948-1949

E. H. Barnhart, president, div. engr., B. & O., Garrett, Ind.

W. F. Martens, first vice-president, supervisor of salvage, A. T. & S. F. Richmond, Cal.

W. A. Huckstep, second vice-president, gen. bldg. supvr., M. P., St. Louis, Mo.

Guy E. Martin, third vice-president, supt. w. s., I. C., Chicago.

F. R. Spofford, fourth vice-president, asst. div. engr., B. & M., Dover, N. H.

Elise LaChance, secretary, Chicago.

L. C. Winkelhaus, treasurer, arch. engr., C. & N. W., Chicago.

Directors

Lee Mayfield, res. engr., M. P., Houston, Tex.

F. M. Misch, gen. b. & b. supvr., S. P., San Francisco, Cal.

W. D. Gibson, w. s. engr., C. B. & Q., Chicago.

H. M. Harlow, asst. gen. supvr. b. & b., C. & O., Richmond, Va.

V. E. Engman, ch. carp., C. M. St. P. & P., Savanna, Ill.

G. W. Benson, supvr. b. & b., C. of Ga., Macon, Ga.

J. A. Jorlett, assistant engineer, Pennsylvania.

Seven subjects were chosen for investigation by committees during the ensuing year. These are as follows: Types of Treated Lumber and Uses of in Building Maintenance and Construction; Construction and Maintenance of Station Platforms; How to Sell Accident Prevention to the Man in the Gang; Installing and Maintaining waterproofing on Ballast Deck Bridges; Mechanization and Specialization of Forces; Concrete Piles in Bridge and Pier Construction; External Protection From Corrosion for Pipe Lines.

The eight committee reports presented during the meeting are printed in full on the following pages, along with abstracts of the discussions that followed their presentation.

Disposal of Liquid Waste at Engine Terminals

Report of Committee*

J. A. Jorlett
Chairman

• Liquid wastes resulting from railroad operations at engine terminals embrace numerous items, and it will be conceded that most of these wastes will find their way back to the natural state via ground water. The presence of these wastes in ground water is a matter which is giving concern to the legislative authorities of most of the 48 states. Back in the 1860-1870 decade many state health departments were organized, chiefly to combat the stream pollution resulting from the rapid construction of sewers, following their introduction at that time. The control was aimed at protecting people from water-borne diseases transmitted by sewage, and to control the discharge of toxic wastes which might menace public health.

From this start sprung strong regulatory bodies, and we now have such state organizations as department of health; fish and game commissions; department of public works; department of agriculture; department of commerce; department of conservation; and department of highways. Overspreading these are the national organizations, the counterparts of these state level groups.

The wide divergance of the word "pollutions" as interpreted by these groups is the cause of some difficulty to railroad managements. Some clarification of the problem may soon be realized since, in 1948, Public Law 845 was passed, whereby the United States Public Health Service was commissioned to establish a "Stream Pollution Laboratory" at Cincinnati, Ohio.

Liquid wastes from engine terminals include principally oil and oily wastes, sanitary wastes, and water treatment plant wastes. Just what is necessary for complete disposal of these wastes will depend on the location and type of materials being handled, as well as the conditions at the point of discharge of the waste materials.

Money invested in equipment for the handling and treatment of wastes represents a capital expenditure, and the cost of operating and maintaining it becomes a part of the cost of hauling passengers and freight. The petroleum, chemical, and paper industries have found it necessary to set up separate administrative officials in charge of departments for pollution abatement. In the railroad field the solution of some part of the waste disposal problem usually involves operations which are part of everyday water treatment practice, such as flocculation, sedimentation, filtration, and sludge disposal.

Classification of Wastes

To meet properly existing or contemplated regulations, and to make efficient use of processes or equipment available to dispose of liquid wastes, classification of the waste material and analyses of the materials involved and their points of origin are essential. Wastes from railway operations can be classified generally in accordance with classifications set up for the petroleum industries. This scheme groups the products in line with their principal objectionable characteristics. These classes may contain some materials that have the same characteristics, but generally they include the following:

(1)—Uncontaminated water waste.
(2)—Storm water waste.
(3)—Oil and oily waste, including emulsions.
(4)—Wastes which affect acidity and alkalinity.
(5)—Wastes which cause taste and odor.
(6)—Toxic wastes.
(7)—Wastes which are highly concentrated solutions of mineral matter.
(8)—Colored wastes.
(9) Wastes which absorb dissolved oxygen.
(10)—Wastes which carry suspended matter.
(11)—Semi-solid or solid wastes.
(12)—Miscellaneous waste products.

Briefly, liquid wastes from engine terminals range from sanitary wastes, storm water, and water from blow-down and boiler wash and tender overflow from some of our older terminals where coal-fired steam engines are the primary power handled, to the wastes from oil-burning steam power and on through where Diesel fuel is used for the most modern motive power and light fuel oils are used in Diesels and electric engines for car heating boilers. Added to these wastes are the alkaline cleaning compounds or emulsified oils used for washing locomotives and locomotive parts; sludges from lime and soda-ash treating plants; and acids to regenerate in the demineralization water treating processes. It is readily seen that the twelve classifications in the foregoing paragraph generally encompass the wastes from most engine terminals.

Analysing the Problem

From assembled records of all materials used and the amount wasted, namely, the quantity of each material which is discharged to a waste interceptor, selection of the type of treatment desired or required is determined. Degrees of treatment decided upon should be based on standards which have been established by the stream-pollution control agency having jurisdiction over the particular area in which the terminal is located. Consideration must be given to the reclamation possibilities of the waste material.

The next step is to go to the receiver

*Chairman of this committee was J. A. Jorlett, assistant engineer, Pennsylvania, New York; vice-chairman was R. W. Humphreys, division engineer, Northern Pacific, Missoula, Mont.

Three representatives of the Pennsylvania...They are (left to right): D. E. Rudisill, asst. ch. engr. m.w.; H. M. Dick, mast. carp.; H. P. Greene, mast. carp.

of the liquid waste material. If the receiver is a stream or other body of water, a volume and waste analysis of it must be obtained. Stream flow records should be studied. Where discharge takes place to a local sewer system or a joint sewerage disposal system, conferences should be arranged with the officials in control of those facilities. They should be acquainted with the proposed plan of disposal and their approval of the proposed plan obtained before any construction is started. When the plan is reasonably assured of execution, much community goodwill can be gained by proper publicity releases on the effort of the company to assist in "Clean Water Programs".

Where treating plants are required, the operation and supervision should be assigned to individuals who are familiar with the method and purposes of the treatment. Frequent or constant tests of the disposal liquids and effluents must be made to be sure the plant is properly carrying out its functions.

Oily and Oil Wastes

Waste fuel oil from steam-powered locomotives on some of our large southern and western lines presents a real disposal problem. This waste accumulates at the roundhouse engine pits, the engine fueling cranes, the fuel oil storage unloading facilities, and at its pits where either fuel oil tank cars or engine tenders are cleaned or repaired. This oil is collected because of its salvage value and to eliminate fire hazards, damage claims, and stream pollution. Sewer pipe lines of proper size connect the various points and empty into a properly designed reinforced concrete oil trap.

Most of the oily waste is in a mixture of hot water and condensed steam, so the next stage is to cool the solution sufficiently to cause the oil to separate from the water. This is accomplished in the concrete oil traps, which are built large enough and are separated into compartments by baffles. In some instances earthen pits augment the concrete traps to allow the solution to cool off. One company permits the oil to flow in small open channels to a point where it empties into a public stream, where proper traps are constructed. Not infrequently the effluent is not clear because the solution is too hot to allow sufficient separation.

The collection of the oil is readily possible because it is lighter than water and rises to the surface. In the traps the oil is skimmed from the surface in the last compartment and is pumped to a reservoir or a tank car, to be eventually returned to the locomotive. Installations of properly working traps have avoided complaints of State Fish and Game Commissions. On the other hand, in populated areas, where the traps have not been 100 per cent efficient, periodic complaints have been the rule, and some claims have been paid where overflow waste oil has gotten onto adjacent property.

With the increasing use of Diesel power, which requires a light grade fuel oil, leakage from underground pipes and valves will result in ground saturation and eventual pollution. Detection of this waste emphasizes the importance of the statement made earlier concerning studies of materials used and materials wasted. A large New England road which used light oil (kerosene formerly and now Diesel fuel oil) for generating steam to heat passenger trains, found that due to the accumulation of spillage in underground channels over a long period of years, oil appeared in the basement of a small hotel across from the engine terminal. Arrangements had to be made to collect this spillage.

Drainage from locomotive and car washing pits includes a combination of oil, and an oil emulsion or an alkaline washing compound. Some success has been accomplished where the alkaline compound is used by dilution of the drainage with large amounts of water. Otherwise, proper neutralization must be made.

A large western railroad has recently installed three commercially designed separators to handle (1) wastes from engine-house pits where boiler-wash wastes and other oil spillage and drippings accumulate; (2) waste from wash racks where engines are cleaned with an emulsified spray; and (3) waste from a tank where engine parts are soaked in a detergent. The largest separator for the first item involves a concrete structure which houses the tanks, separators, pumps, recovered oil tanks, and other apparatus required. The baffles in this installation were built of 5/16-in. steel plates. A feature of this layout is a bypass to take storm water which is collected by the same sewer system. The reclaimed oil from the separator at the wash rack installation is used for washing purposes again.

Another type of separator tank used by one railroad consists of three batteries of 36-in. glazed vitrified tile pipe set vertically, with tile pipe fittings to conduct liquids between the batteries. A concrete deck, with removable steel plate covers, permits access to the pits and protects the tile pipe from damage. Oil from the separator is removed manually.

At another terminal this company built two reservoirs by damming a small stream. The dams are about 80 ft. apart and have outlets at the bottom. When a sufficient amount of oil and grease collects on the surface it was ignited and burned in place.

Diesel Fuel Oil

Where Diesel engines are fueled, a large eastern railroad has recently installed track drain troughs. These troughs drain through a 3-in. pipe to a 550 gal. steel tank buried to suit drainage requirements. A tap is made in the tank for a pipe, to which is attached a 20-g.p.m. rotary hand pump for emptying the contents of the tank into drums. The filled drums are sent to a central reclamation point.

Another source of oil for disposal has risen from the use of Diesel power. Crankcase drainage must be handled. An eastern road reports that all oil from the crankcases of engines is drained into clean steel drums. The drums are marked with the engine number and a sample of the oil is sent to their laboratory for analysis. Oil found satisfactory is reclaimed for other engine purposes. Unfit oil is used as fuel oil at heating plants.

Bulletin 476, Nov. 1948, of the American Railway Engineering Association, has this to say of oil traps of standard American Petroleum Institute dimensions:

"Traps will handle liquids containing Diesel fuel oil, lubricating oil, and various oils used for lubrication. If trap is followed by hay or sand filters, and possibly a bio filter, emulsions can usually be successfully removed. This trap is 20 ft. wide and has 8 ft. of flow depth. The capacity of such a standard section in gallons per minute is not dependent upon the amount of oil present in the water; this controls the depth of the separation baffles; but it is dependent upon the gravity of the oil being handled. If the rate of flow is greater than a single standard section can handle, an additional section or sections must be added. For flow rates less than the capacity of a single standard section a smaller separator is more economical, but it must be designed of such dimensions that the same ratio between width and flow depth, as that of the single standard section, will be maintained.

"The standard A. P. I. trap, properly designed and operated, can reduce the oil content in water to as little as 5 parts per

million, provided the oil is above 18 gravity A.P.I., and there is not much stable emulsion to be handled. The present tendency of regulatory bodies is to require a removal of oil to 10 parts per million, although many concentrations up to 60 parts per million have been permitted to exist. Where the gravity of much of the liquid waste results from a locomotive fuel oil below 10 gravity A.P.I., which is heavier than water, mixing of this oil with higher gravity oils gives a combination which can be handled by a gravity trap. Where emulsions are present, mixing of these wastes with acid wastes prior to entrance to the trap will assist in breaking up the emulsions. Sanitary sewage, excessive silt and sludge will hinder the operation of the trap."

Sanitary Sewage Disposal

At engine terminals in established centers, disposal of liquid sanitary sewage is handled by correctly designed sewers emptying into municipal sewer systems. At terminals away from such centers, and where the personnel is over several hundred persons, properly designed sewage collection and treatment systems must be designed. This will generally include a settling chamber where the solids are removed and are made non-toxic by a biological process; an aeration process to purify the liquid; and a dosage chamber where chlorine is administered to the effluent as a further precaution. This water can be made safe to discharge into streams of small flow, or into streams where it is again reclaimed for use as a water supply. Where discharge is made into a large stream or body of water, less treatment may be required.

Proper health agencies should be contacted where necessary to study satisfactory methods of disposal and the regulations applicable. For smaller terminals septic tanks, with suitable drainage fields, will adequately handle wastes. It is desirable in such an installation to separate the organic wastes from wash waters and inorganic wastes and to keep the latter from flowing into the septic tanks so as not to effect the biological destruction of the solids by bacteria. The size and number of septic tanks should be as recommended by the manufacturer, and will depend on the number of people to be serviced.

Water treating plants at engine terminals include the chemical precipitation processes, such as lime-soda and the base-exchange processes called zeolite and demineralization. The disposal of wastes from these processes may present a local problem from the standpoint of stream pollution or their effect on the appearance of the surroundings. Some railroads use the soda-ash process where the precipitation of the minerals in the boiler water occurs in the boilers of the steam locomotives, and is blown out of the boilers at engine terminals or along the right-of-way.

One company reports that it collects the sludge from the lime-soda process in an earthen sump. When filled, this sludge is excavated with a dragline bucket, loaded into cars, and disposed of in wasting operations on the line. They had no success in interesting farmers in using it as a fertilizer, due to its lime contents, because of the cost of handling the material in its wet state. Where the effluent from the sump pits is conducted to city sewers, care must be taken to see that no solids pass along with the liquid, as removing sludge from such sewer lines may result in considerable expense. In like manner, discharging sludge into ditches and streams is readily detected and results in criticism from regulatory bodies.

Where blow-down operations are done in engine terminals, sewer lines must be designed with proper size and fall or settling of the solids will occur and expensive cleaning of sewer lines will be necessary. Where the problem of sludge removal is acute, lime-soda plants have been designed with settling basins with mechanical equipment for sludge removal. These are built in small duplicate units, where the basins can be shut down alternately and the sludge removed by mixing it with large quantities of water. This diluted mixture can be discharged into streams having a fair flow of water, or into city sewers. When discharge is made into a stream, the outlet pipe should be located below surface at the location where the greatest stream flow exists.

Where municipal sewage systems are carrying wastes of an acid nature from industrial plants, the lime-soda sludge will be very beneficial because of its neutralizing action. A railroad in one city receives credit for the amount of soda-plant sludge put into the city sewer because of this effect. Here again the problem of adequate flow in the sewer lines is important, and the handling of the sludge is transferred from the railroad to the sewage authorities. Several large industries, using this water softening process, have an output of sludge which exceeds five tons of solids per day. Because of high lime costs and other factors, they reclaim the water from the settling basins, dry the sludge, and calcine it back to lime.

With zeolite or demineralization plants, the disposal of brine solutions or acid solutions must be considered. Neither should have any deterring effect in local sewers if the dilution is high. If discharged into streams containing fish, dilution will be necessary to make the resulting content of the waste water and stream water safe to maintain the life of the fish.

Shown here (left to right) are: W. A. Huckstep, gen. bldg. supvr., M.P.; Geo. E. Detzel, the Geo. E. Detzel Co.; George J. Morris, Electric Tamper & Equipment Co.

Conclusions

From the foregoing, the complexity of the liquid waste disposal problem at engine terminals is evident.

This phase of railroad operations, and the increasing activity of regulatory bodies in insisting upon an abatement of stream pollution will require extensive study and planning by a well-trained personnel.

DISCUSSION

President Barnhart began the discussion by reciting an instance where state authorities had lodged a complaint that a leaking oil line of the railroad was discharging oil into a sanitary sewer. The basis of the complaint was that the presence of the oil prevented the solids in the sewage from being processed. After the railroad had found and repaired the leak, the difficulties in treating the sewage solids were overcome.

J. L. Holmes (N. Y. N. H. & H.) cited another instance where, over a long period of time, oil had escaped from railroad facilities and saturated the ground over a wide area. Matters were further complicated, he said, when the government moved an adjacent shoreline 300 ft. farther out by filling, causing all pipe outlets to be blocked. When a nearby hotel complained to the railroad that the oil was getting into its basement, creating a hazard, the road was compelled to take steps to drain the oil from the ground. After consultation with engineers of an oil company, the road dug a ditch 3 ft. wide, 2 ft. deep and 200 ft. long. High tides then caused water and oil to enter the ditch, permitting the oil to be skimmed from the surface and pumped into tenders. In this way the oil was removed at the rate of 200 gal. a week, and, even at the end of a year of such operations, Mr. Holmes said, 50 gal. of oil a week is still being obtained from the ditch.

Methods and Material for Fire Protection for Bridges and Trestles

Report of Committee*

• Fire protection, and particularly fire prevention, for bridges and trestles in remote or inaccessible locations has been a major maintenance problem for many years, and methods and materials used to overcome this problem have varied from the treatment of all timbers in structures to the replacement of open decks with ballast decks, or decks of concrete and steel.

On the majority of railroads it has been the policy to replace open-deck trestles with structures having ballasted decks as rapidly as renewals are necessary, this being particularly true with respect to main-line structures. However, since the replacement of all open-deck bridges and trestles with fire-resistant structures cannot possibly be accomplished for many years, the railroads will continue to have a large number of open-deck bridges and trestles to maintain, many in remote and sparsely populated locations.

L. R. Morgan
Chairman

Asphalt and Gravel Coating

After numerous tests and trials of various methods of protecting open-deck structures against fires, a western railroad developed a method of covering the exposed wood surfaces which gave promise of being extremely fire resistant. This method involves the brushing or spraying on of a special patented asphalt compound, which, under test, was found to form a fire-preventive coating superior to anything previously used. Since its development, the decks of a large number of open-deck structures have been covered with this material, and the process of application has been greatly simplified and improved. At the present time a deck structure 30 ft. long can be completely coated within 2½ hr., if the materials are reasonably accessible.

The most effective results with this method are being obtained by making a hot application of a primer coat to the exposed wood surface, after the surface has been made reasonably clean of dust and dirt. The primer coat is applied with brush or spray to a reasonably heavy film, care being taken to see that all cracks or crevices are filled. Special care should be taken to be sure there is no exposed wood in corners and angles.

A second coating is applied immediately after the primer coat, by brush or spray, covering all surfaces with a 3/16-in. thick layer of the patented asphalt compound, which contains asbestos fibres and gilsonite. Immediately after the application of the second coat, crushed stone, washed, and from ⅛ in. to ⅜ in. in size, is spread over the hot compound in a layer about ½ in. thick. An excess of the aggregate should always be provided so that the compound will take up and anchor the maximum amount of the material.

As both the primer and top coating contain volatile solvents, the aggregate should be spread immediately behind the application of the second coat to minimize the possibility of fire, and so that the aggergate will anchor or set in the coating as the solvents volatilize. On important structures, or when weather conditions are such that volatilizing of the solvents is retarded, it may be well, for a period, to guard against possible fire by having sand available to smother any hot metal, ashes, or other combustibles which might fall on the surface.

Applying the Aggregate

No particular effort is made to apply the aggregate to the vertical surfaces of ties and stringers. However, a 1-in. board is nailed to the sides of guard timbers after the second coat is applied, leaving a ½-in. space between the board and timber, which is then filled with aggregate. In a few hours the board may be removed, leaving the aggregate held in place on the sides of the timber by the compound.

Spacer blocks and sidewalk ledgers are given an extra heavy coating of the compound and aggregate, particularly if in depressed position. However, recent construction changes bring spacer blocks to the surface of the ties, thus eliminating pockets for hot metal or ashes to fall into. As the compound has a tendency to stretch over cracks and to sink into low spots without affecting its continuity, the heavy application of the compound in depressed areas is desirable, compensating for the shrinkage and splitting of timber.

To obtain an effective and reliable fire-resistive coating it is necessary that the aggregate be thoroughly washed, and that the timber upon which the compound is applied be thoroughly dry. In warm climates it is not necessary to heat the primer or compound, but in cold weather it is beneficial to heat both, as well as the aggregate. The material bonds equally well on untreated or treated surfaces, with the exception of newly-creosoted timber. Best results in the case of creosoted timber are obtained after the timber has aged for one season after treatment.

The combination of compound and aggregate holds white hot brake shoe splinters or burning fuses away from the wood so they will chill or burn out without setting fire to the wood. Even when the heat is so intense that it will char the wood below the protecting coat, the wood will not burst into flame and burn.

The wide climatic variations on western railroads has been another factor of major importance in the application of fire-resistive coatings to bridge decks, since all previous treatments leeched out under rain and sun, or cracked and disintegrated under freezing weather. This compound has proved equally effective in desert and mountainous territories.

Experience of Second Road

Another railroad has reported the use of this method with satisfactory results, and excerpts from its report follow as a matter of additional information.

"The protection of the deck with a patented heavy roofing product and pea gravel appears to have excellent possibilities, with a life of eight to ten years, and can be applied at a reasonable cost. The product consists of a thin primer coat, followed by a final coat, ⅛-in. thick, into which clean gravel, ⅛-in. to ⅜-in. in size, is embedded. The tops of stringers, tops of ties, sides of ties over the stringers, and tops and sides of the guard rails, should be protected. The product can be applied by hand with mops or brushes, or by spray. The protection has been applied by hand to two trestles with a combined length of about 1800 ft., at a cost of about $1 per lin. ft. of bridge. On another structure, 4,340 ft.

*Chairman of the committee was L. R. Morgan, fire prevention engineer, New York Central, Detroit, Mich.; vice-chairmen were G. W. Rear, Jr., assistant fire inspector, Southern Pacific, San Francisco, Cal., and B. M. Whitehouse, chief fire inspector, Chicago & Northwestern, Chicago.

long, the protection was applied by pump sprays at a cost of about $0.75 per lin. ft.

"An air-operated pump is placed in a drum of the primer and a second such pump is placed in a drum of the heavy final coating material. These pumps force the material through the supply lines to the spray head, where it is atomized by its contact with air. One pump can be used for both coats, but this will require the cleaning of the supply line after each coat is applied. The pumps operate on 30 to 40 lb. air pressure. A 100-lb. compressor with a long air supply line will reduce the moving of the compressor to the minimum, yet furnish sufficient pressure to operate the pumps.

Application—Results

"All surfaces to be protected should be free from dust, dirt and surface moisture. If the timber is wet, proper adhesion cannot be obtained and 'peeling' of the material will result. The thin primer coat should be followed by the final coat within 20 to 30 min., and the ⅛-in. final coat should be followed by the embedment of pea gravel within 40 min. The gravel should be tamped or rammed into the material to get adequate embedment. To embed the gravel into the coated sides of guard rail or ties, a short, thin board is first placed against the bottom of the guard rail or tie to form a trough. When this trough is partly filled with pea gravel, and the board raised with a slight pressure against it, the gravel is embedded on the sides of the timbers. A foreman and five men are required to apply the treatment if the compressor can be kept off the bridge, but two additional men are required for flagging if the compressor is kept on a push car. The work should be carefully inspected before the gang leaves the site, and any irregularities in the coating corrected. If 'bleeding', caused by an excessive final coat, is detected, additional gravel should be applied.

"Lighted fusees and white hot pieces of metal have been laid on boards given this type of protection and have burned out without damage to the protection or the boards. The primer and final coat will fill and seal all cracks in the timber under them, thus preventing the entrance of water and prolonging the life of the timber."

The protection of wood in railway bridges and buildings was discussed in an excellent paper by George M. Hunt, Director of the Forest Products Laboratory of the Forest Service Bureau, U. S. Department of Agriculture, presented before this association last year and printed in the proceedings of the 53rd annual convention. This paper did not confine itself to fire protection, but contains several pertinent paragraphs which we commend to your attention.

This large group was from the Southern. Standing (left to right): A. H. Graham, div. engr.; H. T. Arthur, div. engr.; J. W. Fulmer, engr. of trk.; A. E. Hendrix, trk. supvr.; R. L. Fox, div. engr.; A. R. Bookout, asst. div. engr.; W. H. Wood, div. engr.; C. W. Sigman, trk. Supvr.; J. R. Goodman, asst. trk. supvr.; C. M. Setzer, b.&b. supvr.; J. M. Peek, student app.; D. Wetterau, asst. trk. supvr. Seated: G. S. Baron, student app.; J. R. Hopper, trk. supvr.; J. T. Roberts, trk. supvr.; M. P. Oviatt, b.&b. supvr.; T. M. von Sprecken, asst. to ch. engr.; J. F. Griffith, asst. ch. engr. m.w. & s.

There are several methods of retarding the spread of fire on bridges and trestles which have been in use for a comparatively long period of time. Such methods include the asbestos-board shielding of bents, the use of fire-resistive construction at intervals in long trestles, and the use of metal coverings for protection against the ignition and spread of fire. Since much information concerning these methods is already available, they will not be discussed in this report.

Bent Fires

Another important phase of this subject concerns the protection of bents against fire. It is, of course, very important that the ground around and beneath timber trestles be kept free of vegetation and other combustible material at all times, for a distance of at least 15 ft. from the nearest timber. The number of cleanings per year will depend upon climatic conditions, but cleaning should be done at least four times annually in some southern localities where rainfall is heavy and the growing seasons are long. The cleaning is usually done by "shovel cutting" and, occasionally, where the ground will permit, by power machines, such as graders or bulldozers. Unfortunately, many of the timber trestles must be shovel cut. This costs about $0.32 per lin. ft. of trestle (50 ft. wide) for each cleaning, which represents a very heavy yearly expense when three or more cleanings are required annually and many trestles are involved.

Last year one railroad applied a granular, unrefined borax under and around five timber trestles as an experiment, and the results were so gratifying that this year five miles of trestles were treated. The estimated annual saving, based on one application, is at least $0.77 per lin. ft. The chemical is not injurious to man, animals or fish, and is non-corrosive to ferrous metal. One application of 12 lb. per 100 sq. ft., applied by hand, will give protection for at least a year, and in many cases for two years.

All persons making inspections of bridges should be on the alert for and remove any combustible substances that might be, or might become, in contact with any timber or piling. Dry leaves, paper and rags are often found on decks and make excellent places to start a fire when exposed to burning oil, cinders or hot metal falling from passing trains. Any partly decaying timber that forms a fire hazard should be removed.

Suppressing Fires

It is in order to consider means of suppressing or extinguishing such fires as may occur at bridges and trestles. One of the most common means is, of course, the familiar water barrel and pails, and often this is the only feasible method because of the isolated location of the bridge or trestle, which makes the cost of other protection prohibitive. The necessity of adequate inspection of such barrels and pails cannot be overemphasized because of the possibility of damage or theft, which would completely defeat the purpose of the protection.

Another peril in many sections of the country is that of freezing, which is customarily overcome by the use of a calcium chloride solution in the barrels, rather than plain water. This solution should be prepared in a separate container and then strained and put in the fire barrels. The amount of calcium chloride required per gallon of water must be such that no freezing will occur at the lowest possible temperature encountered in territory in which the barrels are located. Usually four pounds of the chemical to each gallon of water will be sufficient for most parts of the United States.

The use of hose and under-deck sprinkling systems is possible, but such must be confined largely to sections of the country not subject to low temperatures because of the large cost that would be involved in protecting such equpiment against freezing. Where such installa-

tions are contemplated, it is necessary that one be guided by the particular circumstances encountered, because conditions are so variable that no set rules can be promulgated which will be uniformly applicable or effective.

DISCUSSION

T. E. Jackson (S. P.), discussing the asphalt-and-gravel method of fire protection, referred to the difficulty of getting stone screenings to adhere to the sides of ties and guardrails and stated that he preferred placing them with the hands instead of with shovels. S. White (S. P.) said that he had found it too costly to try to apply screenings to the sides of timbers and had given up this practice. Lee Mayfield (M. P.) said that he uses a board along the sides of the timbers to form a trough, which facilitates the application of screenings. Mr. White was not convinced, however, and said he had found that in hot weather the screenings loosened and dropped off.

George Walker (M. P.) stated that he had been applying a coating of sand to newly-creosoted timbers and that it had proved effective for fire protection. L. R. Morgan (N. Y. C.) said that he used cement in the same manner for this purpose, a practice to which H. W. Routenberg (B. & O.) also ascribed, declaring that it held up well under foot traffic.

G. J. Bass (G. C. & S. F.) observed that, when vegetation is cut under a bridge, it should be removed from the premises. Otherwise it would present a worse fire hazard than when green, he said.

R. E. Dove (R. E. & M. Cyclo.) stated that the use of water barrels as fire protection on bridges was being abandoned by some roads because they never seemed to contain water when an emergency arose. P. F. Huston (C. & S.) agreed that many barrels were used as targets by hunters, rendering them useless as water containers. He said that on his road these barrels were filled with sand, especially in territory where water is hard to obtain, and that the sand is effective in quenching fires.

Methods of Prevention and Removal of Corrosion from Steel Structures

Report of Committee*

W. C. Harman
Chairman

• Many methods of rust prevention have been tried, some in an experimental way, but there is still a large field for investigation. There are three principal methods by which the corrosion of steel structures can be combatted:

(1) Choice of more corrosion-resistant steels, such as alloy steels, high-tensile steels, or non-ferrous materials.

(2) Use of protective coatings; (a) Metallic coatings, such as galvanizing and zinc, lead, tin or other metal platings. (b) Non-metallic coatings.

(3) By the cathodic method or similar devices.

Special Steels

Copper-bearing steel increases the corrosion resistance of the steel at only a slight additional cost. Such steel has been used to some extent, but has not yet come into such general use as to warrant its general adoption.

The use of high-tensile steels of silicon or nickel and other alloy elements is increasing, and while not generally used in all types of railway bridge construction, sufficient tonnage is in service to prove the value of its corrosion-resistant qualities.

In the San Francisco area, where 44 million pounds of steel were used in the Suisun Bay railway bridge, approximately 80 per cent was silicon steel. While the maintenance of this bridge is of the best, inspection shows that the silicon steel members have much better resistance to corrosion than the carbon steel members, particularly the eye-bars. Farther up the coast, highway engineers, in designing bridges, have resorted to nickel alloy, high-strength steel. Recent reports indicate long life and low maintenance costs. The value of these metals should not be underestimated, and such wider use of them can be anticipated, resulting in large savings in maintenance.

Metallic Coatings

Galvanizing is the most widely used metallic coating for preventing corrosion. Galvanized steel or iron sheets are used extensively in railway structures. Galvanized bolts, and pipe anchors for pole lines, are other important uses. In the bracing of the bents in the trestle across Great Salt Lake in Utah, and in seawall construction on the Pacific coast, galvanized steel bolts were used. These have been in service in the trestle since 1923, and some removed recently during repair work were found in excellent condition and were reused. Bolts used in the seawall for anchoring the laminated wooden facing to the concrete are still in good condition after eight years of wet and dry salt water conditions.

Metallized coatings applied to steel structures, by spray-gun process, have been used where other means of preventing corrosion have failed. Generally this method is utilized where aggravated conditions warrant the expenditure, such as at locations where brine drippings from refrigerator cars cause heavy damage to steel bridge members.

A bridge at Kansas City, adjacent to a packing district, was given such protection. This bridge, which was subject to excessive drippings, had been previously protected by 3/16-in. iron plates. The first application to the floor system was made about 13 years ago. This consisted of a spray coating of zinc, 0.008 in. in thickness. The cleaning in this case was not very thorough, so more attention is now being given to cleaning operations, and a coating of 0.012 in. thick is being applied.

It is anticipated that this metallic coating will protect these members for 20 years. Based upon this experience, the road owning this bridge has adopted the metallizing of the top flanges of floorbeams and stringers before they are erected in a structure. The cost of these applications varies, ranging from $1.00 to $1.25 per sq. ft. in the field. When done in the shop, the cost can be reduced to 60 cents to 75 cents per sq. ft. (The preceding figures are 1939 costs.) The pro-

*Chairman of this committee was W. C. Harman, bridge and building supervisor, Southern Pacific, San Francisco, Cal.; vice-chairmen were M. Block, engineer bridges, Illinois Central, Chicago, and W. K. Manning, supervisor bridges, Erie, Port Jervis, N.Y.

cess of metallic coating spreads a tight film of corrosive-resistant metal over every joint in laps, seams and around rivet heads where moisture might pocket, and thus reduces corrosion.

Removal of Corrosion

The cost of removing corrosion from steel structure includes: (1) The preparation of the surface; and (2) the application of the protective coating.

The preparation of the surface often absorbs 25 to 80 per cent of the entire labor cost of the job. The higher costs are sometimes due to deferred maintenance, but are usually attributed to atmospheric conditions or chemical action. Since the major cost of the removal of corrosion involves the cleaning of the surface before paint is applied, more effective and economical methods of cleaning and removal of corrosion are being developed. The most widely used method for removing rust is the steel scraper, the wire brush and chipping hammers. Air tools require compressors and contingent equipment, and are generally used where more extensive or heavy cleaning is to be done. Flame cleaning, using a broad oxyacetylene flame, has more recently been employed. This method greatly accelerates the removal of all foreign matter, including rust, if used in conjunction with the steel wire brush.

It is more difficult to use in the field, on some roads, due to traffic restrictions, but can be used in the fabricating shop to great advantage, particularly in the removal of mill scale. The shop paint coat should be applied while the surface is still warm.

Another method of cleaning is sand blasting. To be done economically, this method requires complete equipment of proper capacity. Its use is confined largely to the cleaning of large areas. It is efficient and removes all foreign matter and the mill scale, leaving the surface ready to receive paint. Dry sand for sand blasting should be hard and sharp, and the nozzle should be of a size for the type of sand to be used.

The use of sand blasting is restricted to more isolated areas, where the harmful effects of flying particles is minimized. Moisture may be carried to the steel unless the sand is thoroughly dry and atmospheric conditions are satisfactory. This may be a factor in determining the method of cleaning. Employees may also raise objection to the dust inherent in this method. Steel shot has been used where facilities are provided for its reuse, but generally its use is only feasible in plants.

The cost of cleaning steel structures varies so widely that it is difficult to give any unit costs.

Drying paints with red-lead primers are still used extensively, primarily because of the greater penetration of linseed oil. New steel should have a shop or prime coat, one intermediate coat, and a final finish coat. Structures previously painted should have two coats—a spot or prime coat and a final coat. For minimum maintenance, one finish coat is desirable. This applies where the existing surface is in good condition, or for appearance. Proper cleaning prior to painting is most important. The steel surface should be free of moisture and improper temperatures during painting should be avoided.

The Milwaukee men who attended the convention included (left to right): K. E. Horning, arch.; H. C. Minteer, div. engr.; S. E. Kvenberg, asst. engr.; C. E. Morgan, supt. wk. equip. and weld.

Two methods of painting are in general use. Some favor brushing, claiming that the brush pressure will help to make contact with the steel, giving better adhesion. Spray painting can be very satisfactory when applied over clean surfaces which are thoroughly dry. The selection of the proper paint is very important. A wide variety of synthetic resins, some of which possess special properties, have been placed upon the market, making it highly desirable to study conditions before a paint is selected. However, most roads make use of a basic paint containing red or blue lead and linseed oil as a primer, and follow it by a good long oil finish coat.

Softening Agents

Softening agents as rust-preventive compounds, generally classed as petrolatum, have been used to some extent for the past two decades. One road has used such rust preventives on steel viaducts along the sea coast and claims excellent results. Previous to their use, steel structures, painted with the red lead and carbon or graphite paints, required frequent spot coating and heavy cleaning. By using rust-preventive compounds an out-of-face job is required only every five or six years, instead of two years, resulting in a saving in maintenance costs of as much as 50 per cent. These softening agents can be diluted and sprayed, but some roads prefer brush application, which assures a more uniformly heavy coating, especially on rivet heads. A coating not less than 1/16 in. in thickness on webs and other wide areas seems desirable, but on lower girder flanges, laterals, lacing bars, and rivet heads, a heavier coating is applied, giving better protection.

Cathodic protection has been utilized to some extent on railway installations and in protecting pipe lines and boilers from corrosion, and many installations have been made in water tanks. Its application to steel bridges, buildings or turntables is probably more in the future. One railway has ten cathodic installations in water tanks of various sizes. Inspection of the oldest installation—in service three years—indicates an arresting of corrosion, shown by a heavy deposit of flake rust at the base of the walls.

The nature of the soil or water, the amount of moisture, the presence of foreign objects or stray currents, all influence the type and extent of cathodic protection to be used, so each installation must be carefully studied. While such protection is basically the same for protecting all steel structures, the feasibility of such protection is being studied extensively by national engineering groups. In the San Francisco Bay area, an active committee, including representatives of interested industries and the railways, is making field test installations to arrest the corrosion action on buried pipe lines and conduits. This corrosion has increased at an alarming rate since the removal of electric lines in this area—the car lines having furnished the electric field which had previously held corrosion in check.

Conclusion

Methods of preventing and removing corrosion from steel structures are varied and their effectiveness depends greatly upon the character of the structure, local conditions, and the character of corrosion. The choice of more corrosive-resistant materials will decrease the necessity for frequent cleaning of structures.

The use of protective coatings on parts of steel structures, either metallic or nonmetallic, will minimize the extent of corrosion. In the protection of steel surfaces by means of paints, clean dry surfaces are essential before the paint is applied. Cathodic protection on some types of steel structures, such as water tanks, is being used with some success.

DISCUSSION

In the absence of Chairman Harman the report was read by G. W. Benson (C. of Ga.). H. W. Routenberg (B. & O.) began the discussion by recounting

the effects of mill scale on paint coats. He said that if the shop coat is applied before the scale is removed the mill scale pops off in about six months, leaving the bare metal exposed. F. W. Evinger (Patterson Sargent Co.) advised that the adverse effects of mill scale on the paint will sometimes continue over a period as long as 20 years, but that they could be eliminated by proper cleaning before painting. Some roads, he said, specify that their steel be delivered without a shop coat, and that, after the steel has weathered for some time, they remove mill scale and oxidation by sand blasting or by the use of an oxacetylene torch before painting. This practice, he added, produces an excellent surface for painting.

R. A. Van Ness (A. T. & S. F.) brought up the matter of spot painting, saying that he did not believe in painting the inside surfaces of members just because the outside surfaces were being painted. It has been his experience that the surfaces exposed to the sun require painting most frequently. He added that many of his bridges were in a dry, warm territory, but that generally he obtains about 12 years of service from one prime coat and one cover coat. In answer to a question raised by T. E. Jackson (S. P.) as to whether or not he uses a protective coating during the period that steel is weathering, Mr. Van Ness said that a rust-preventative compound is used which is wire-brushed off before the oil paint is applied.

Lee Mayfield (M. P.) stated that he applys a rust-preventive compound by spraying, pumping it direct from the drums without dilution. This produces a coating about 1/32 in. thick, he said, which hardens quickly in the heat.

Mr. Benson said that flame cleaning was most desirable for cleaning the insides of water tanks, especially those that cannot be removed from service for any great length of time, because the warmed steel facilitates the subsequent drying of the paint.

In reply to a question raised by L. C. Winkelhaus (C. & N. W.) regarding the durability of aluminum paint, Mr. Evinger said that the use of the proper vehicle was most important in obtaining satisfactory performance. President Barnhart stated he had used aluminum paint on both new and old work, and that, to date, its performance had been satisfactory.

J. L. Dougherty (W. Md.) asked about the effectiveness of flame cleaning with respect to removing mill scale. C. A. Daley (Air Red. Sales) advised that mill scale will pop off readily with the use of a torch, adding that the surface should then be painted while the metal is still warm.

Installation and Maintenance of Built-Up Composition Roofing

Report of Committee*

W. H. Bunge
Chairman

• The roof is a very essential part of any building as it materially affects the life, as well as the usability, of the structure. The use of good materials is important, but more important is good workmanship, without which a first-class roofing job cannot be obtained. Built-up roofing is used more extensively on flat or nearly flat roof surfaces, but in some instances is applied to roofs with a slope as great as six inches to the foot.

There are many types of built-up roofings, and in selecting the type of roofing for a particular structure it is necessary to consider the pitch of the roof, the type of surface to be covered, the use for which the building is intended, the fire resistance of the surface required by laws and ordinances, or desirable for other reasons, including appearance and the anticipated life expectancy of the structure. When manufacturers' specifications are complied with, built-up roofs may be guaranteed or bonded for periods of 10, 15, or 20 years, although the time limits specified do not necessarily indicate the life expectancy, as additional life may be obtained by proper installations and careful maintenance.

Bonding Mediums

The two bonding mediums most generally used are coal-tar pitch and asphalt, pitch being used with tar-saturated rag felts and tar-saturated asbestos felts. Pitch may in some cases be preferable on flat or nearly flat roofs with a slope of 2 in. to the foot or less, and when finished with a slag or gravel surface. However, on one railroad system smooth surface asbestos and asphalt roofing is used almost exclusively. Some manufacturers' specifications provide for the use of pitch on a slope of 6 in. to the foot by finishing the surface with asphalt and slag or gravel. Flat coal-tar pitch roofs are in some cases inundated with a few inches of water to stabilize temperature.

Roofing asphalts are obtained from two sources—petroleum by-products from the refining of petroleum oils, and native asphalts mined from the earth. Petroleum asphalts, when properly blended, produce a good bonding and weather-resistant material. Native asphalts contain much foreign materials and require considerable refining prior to use as a roofing material. Bonded asphalts are preferable as they are properly blended and contain less impurities.

After the type of roofing desired has been selected and proper materials provided, an inspection of the surface to be covered should be made in order to see that it is in proper condition for the roofing application. Steel roof decks should be covered with an insulating material, preferrably one or two laminations of a ½-in. insulating material.

Concrete or gypsum roof slabs must be coated with a manufacturer's primer prior to application of the built-up roofing.

Wood sheathing should be closely inspected for defective nailing, voids in board joints, large knot holes, and other irregularities, which may be corrected by the installation of heavy base flashing material or sheet metal. On buildings where steam locomotives are housed and other buildings where detrimental gases are discharged, wood roof decks should first be covered with building paper.

In addition to the selection of the type of roofing and the proper materials to fit the specific installation, it is also requisite to provide good equipment for use in fabrication, such as a dependable hoisting

*Chairman of this committee was W. H. Bunge, assistant engineer, Missouri Pacific, Houston, Tex.; vice-chairman was L. E. Peyser, architect, Southern Pacific, San Francisco, Cal.

apparatus, good mops, and a heating kettle, preferably oil fired and equipped with high-temperature thermometer for easy reading. Flash-proof kettles are recommended as a protection against fire hazards. These kettles are now available in several sizes and will prevent fires at temperatures of 100 to 150 deg. over the normal flash point as specified by the manufacturer. As additional prevention of fire, a foam-type fire extinguisher and sand buckets should be available an all roofing jobs. (Several fires have occurred during the application of hot asphalt roofing, resulting in considerable damage to buildings.)

Asphalt should be heated to 375 to 425 deg. F. and maintained within this range of temperature according to the slope of the roof, type of material being used, and climatic conditions. Pitch has a low melting point but a high viscosity, and may be hard to spread properly below 325 deg. F. Asphalt has a higher fluid heat point but a lesser viscosity, and should be heated to at least 375 deg. F. before use so that equal distribution of the liquid will be obtained, without a heavy deposit in any area. Great care must be taken to avoid excessive deposits of asphalt. Such deposits are objectionable on the finished surface of smooth-surface roofs since they will harden after a short time, alligator, and sometimes cause breaks in the felts. They are also a detriment in case additional top sheets are to be added at a later date.

Laying Felts

Proper laying of the felt laminations is very important. Placing of felts should follow closely behind the mop and they should be either rolled or brushed into total adherence to the next ply to aid in the elimination of blisters and buckles. Perforated felts are helpful in the elimination of blisters.

Gravel or slag-surface roofs give added protection from the elements, such as hail and windstorms, and reduce solar radiation, lowering the volatile action in the cementing medium. They also offer added protection when subject to being walked on, or to deposits of debris. One objection to the use of gravel or slag-surface roofing is the difficulty of locating and repairing leaks.

An economical type of roofing that is being used to some extent over roof decks with a slope of 1 in. to 6 in. per foot is fabricated by the application of one or two base felts nailed or mopped over the roof surface, over which a mineral-surface selvage top sheet is hot mopped. This type of roofing may be bonded or guaranteed for a period of ten years and is available in colors which may enhance the appearance of the structure.

A recent development in the roofing industry is the cold process method of laying roofs, using specially manufactured roll roofing in place of the usual felts. This roofing is manufactured by saturating a dry felt with a waterproofing asphalt to provide flexibility, then coating both sides with a stabilized asphalt coating to provide weather-resisting qualities. Rolls contain 108 sq. ft. and weigh 53 lb. Two plies are required, which are bonded together by using a cold-process cement having quick setting characteristics. The finished surface is coated with a static asphalt coating. One large railroad is using cold-process roofing quite extensively on roundhouses, shop buildings and other buildings with 300 to 400 squares each. They are maintained by recoating the surface every 4 or 5 years.

In this group are (left to right): H. E. Michael, assoc. editor, R. E. & M.; W.E. Kropp, supvr. m.w. wk. equip., L. V.; Geo. M. Cooper, Eastern Railway Supplies, Inc., N. V. Engman, assoc. editor, R. E. & M.

Another type of built-up roofing developed recently involves the use of embossed aluminum sheets. Aluminum sheets 0.004 of an inch in thickness are furnished in rolls 36 in. wide by 360 ft. long, containing 1080 sq. ft. They weigh 63 lb. per roll. Application is made the same as in the use of conventional felts and with the same equipment. The specifications require the application of a 30-lb. asphalt-saturated base felt, over which two plies of embossed aluminum are hot mopped with asphalt, lapping each ply 18 in. and leaving the last ply of aluminum uncoated. The manufacturers claim for this type of roofing a reduction of 15 deg. on inside summer temperature and a reduction in roofing weight of one half to two thirds. It is also stated that this type of roofing should last 25 to 45 years. Several large industries are using this material.

Flashing

Too much importance cannot be attached to the proper application of flashing and edging. It is conservatively estimated that 75 per cent of the defects found in built-up roofs are due to failure in this phase of the work. They must be installed in conjunction with the roofing application and should be clearly covered in the specifications and detail drawings. Fabric-reinforced asbestos base flashings material has proved very effective for this class of work.

Flashing may be nailed horizontally along the upper edge of wood-frame structures and in mortar joints on masonry structures. It should then be carried down and out on the roofing and be cemented thereto. It should never be nailed to the deck when nailed to the vertical surface; conversely, when material is nailed to the roof deck do not nail it to the vertical surface. This permits contraction and expansion of the roofing and flashing under varying weather conditions without breaking the felts.

Over nails apply a 5-in. wide application of asbestos cement, into which imbed a 4-in. wide 15-lb. felt strip and cover with asbestos cement about ⅛ in. thick This protects nail heads and prevents water infiltration. Sign supports fastened to or projecting through the roof deck should be panned in with lead containers filled with hot asphalt or pitch.

Built-up roofings are fire resistant and provide a wide range of selection as to type and finish, according to the structure involved. On gravel or slag-surfaced roofs it is desirable to apply at least 400 lb. of gravel or 300 lb. of slag per 100 sq. ft. area, as the Fire Underwriters state that fire-resistant qualities are dependent solely on the amount of excess gravel or slag left loose on the surface.

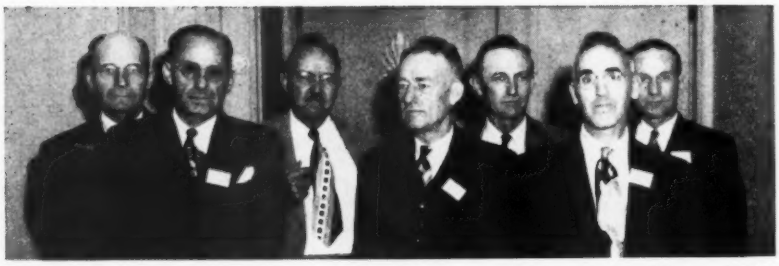
It is recommended that the manufacturer's specifications be followed closely. Careful supervision and close inspection should be utilized in the application of built-up roofs. The manufacturer's guarantee is desirable; however, in most instances failures are the result of faulty application.

Inspection and Repairs

The time limit specified for the bonding of a built-up roof can be greatly increased by thorough periodic inspection and repairs.

In most cases it is convenient to wait until a roof is reported or found leaking, and then make only spot repairs. Unless access to the roof is provided in construction most roofs are difficult to inspect properly. Also, railroad buildings, being located over wide areas, require much time to inspect and to supervise work.

It is recommended that perpetual record be made for each building, showing type of roof, date installed, data on flashings and drains, and any peculiarities. At regular intervals inspections may be made and the date and findings entered on the record, together with a description of repairs made. Inspections should be made by experienced men who have a thorough knowledge of roofing



Five different railroads are represented by this group, which includes (left to right): V. E. Engman, ch. carp.; C. M. St. P. & P.; O. G. Todd, asst. div. engr., H. W. Routenberg, mast. carp., T. E. Snyder, mast. carp., all B. & O.; C. E. Wallace, gen. fore. b.&b. and w.s., St. L.-S. F.; Geo. H. Priest, gen. fore. b.&b., C. N. R.; Shirley White, b.&b. supvr., S. P.

and its composites, and be able to prescribe a remedy within a reasonable cost. In fact, the inspection and specification for repairs to built-up roofs may be compared to a doctor's diagnosis of a patient and prescribing for his ailments.

Since stresses and strains affecting the lower part of a structure can very often cause roof troubles, it is sometimes better to work from the ground up. Examine the walls, both exterior and interior, watching for cracks and signs of building movement that frequently show up at the lintels above doors and windows. Investigate all drainage facilities and look for signs of dampness that may indicate the location of the roof problem.

Finally, inspect the underside of the roof deck. Water-marked, curled or rotted boards indicate trouble on wood decks, while stains or rust spots usually mean rusted reinforcing rods due to leaks on concrete decks. On steel decks, rusted purlins, clips or welds will often lead to the source of trouble. On gypsum decks, spalling can mean a leak. Such ground work may lead directly to the weak spot, particularly on gravel or slag surface roofs, as the gravel covering conceals faults.

On the roof itself, any debris should be removed and that part of the roof that has been covered should be carefully examined. Paths of foot travel may have worn through the felts. Previous weakness, indicated by old repairs, may have reoccurred. On a tar and gravel roof, the gravel may have washed away, leaving the felts exposed; and on the smooth-surface roof, the felts may be alligatored, indicating that the sun has drawn out and evaporated the asphalt, leaving the felts dry and brittle.

In making spot repairs, under favorable temperature conditions, remove the damaged felts, clean the roof surface, nail or mop the first ply of the felt, and mop solid the remaining plies. This is not difficult on a smooth-surfaced roof, but on gravel or slag-surface roofs it is necessary to spud off the surface material, being careful to minimize damage to the felts. Blisters should be split open and, when dry, the felts recemented in place.

In some instances the old roofing may have deteriorated to such an extent that complete renewal is the best alternative. On smooth-surface roofs, where the surface is not in too bad a condition, two plies of 15-lbs. asbestos felts (after application of primer) may be hot mopped over the old surface and the top surface finished with static roof coating, which will extend the life of the roof for several years. On a smooth-surface roof with a slope of at least one inch per foot, a mineral surface selvage cap sheet, hot mopped in place, will provide several years' service

Smooth-surface asbestos felt roofs may be maintained by the application of a light body bituminous static roof coating. This coating should be applied about every four or five years for best results.

There are several cold applications available for coating over old composition roofs that provide an economical means of extending the roof's life. In connection with the cold application, asphalt-coated fabric should be used for repairing breaks in the surface, in the valleys and around parapet walls and flashings.

The roof drainage system is another source of trrouble. Gutters or downspouts that are filled or broken, drains in the middle of the roof, and scuppers through parapet walls, can often cause roof leaks.

Many instances occur when roofs are reported leaking and the fault is actually in the flashings. Flashings may be defective around skylights, monitors, ventilators, valleys, parapet walls or adjoining walls, and sometimes in the copings.

Plastic roofing cement containing asbestos fibre, used with saturated fabric, is a practical material for flashing repairs. First coat the surface about ⅛ in. thick with plastic cement, allow time for plastic cement to become tacky, then apply fabric, smoothing it out firmly, and then again coat surface with plastic cement ⅛ in. thick.

Safety Precautions

Some thought should be given to safety, as roofing work is a very hazardous trade. The following practices are some well to remember: The wearing of rubber-soled shoes is an aid to prevent slipping and will prevent damage to the roof. When footing is dangerous, use safety ropes securely fastened. Do not permit men to back up when unrolling roofing. Keep loose nails off the roof. Use inspected ladders, set at an angle of approximately 70 deg. Check hoisting equipment. If the conventional cantilever tripod is used, provide sufficient sand bags for counterbalance. The use of ordinary cement buckets is dangerous, and pails properly designed to carry heavy loads of hot stuff should be provided.

A major portion of the accidents on roofing jobs are caused from burns, and a first-aid kit should be available at all times. A treatment that has been found satisfactory for asphalt and pitch burns is as follows: Clean with carbon tetrachloride and paint with one per cent of Gentian Violet solution. Gentian Violet may be applied two or three times during the first day, using a small gauze dressing. Gentian Violet is seldom used on face burns because of stain. Boric ointment, Unguentine or similar salves are all right if the burn is not serious. In case of serious burn use carbon tetrachloride and call a doctor.

Conclusions

It is the consensus of the committee that of most importance is workmanship or method of application, and in summary the following recommendations are made:

(1) Carefully select the type of roofing suitable for the surface to be covered.

(2) Provide adequate equipment for installation purposes, safety of the workmen, and the prevention of fire.

(3) Inspect and properly prepare roof decks.

(4) Provide continuous temperature control of the cementing medium.

(5) Give special attention to the installation of flashings.

(6) Arrange for periodic inspection and records of maintenance performed.

(7) Practice safety and make provision for first aid.

DISCUSSION

The discussion was opened by H. W. Routenberg (B. & O.) who declared that surface cleaning before roofing is applied is very important, and that his road applied roofing with the cold-process method, using air equipment both for the cleaning and spraying. S. White (S. P.) stated that he employed the cold-process method for applying roofing on smooth-surfaced roofs where extreme hot temperatures prevail, and that he used burlap instead of felt with good success. Mr. Routenberg said that jute, saturated with the oils used in its manufacture, had been used by his road on pier roofs. Such roofs, he said, are recoated after three or four years of service.

Guy E. Martin (I. C.) inquired if proper precautions were being taken to prevent the bonding mediums used with built-up roofs from getting into sewers and clogging them. Chairman W. H. Bunge agreed that care should be exer-

cised to prevent bonding materials from running.

Mr. Routenberg stated that he had been experimenting with alumnium sheets as flashing material and wondered if others had had any experience with such sheets. Mr. Martin pointed out that aluminum sheets had a tendency to split when being nailed, and that it was important that all fastenings be properly protected to prevent their rusting. L. C. Winkelhaus (C. & N. W.) raised the question as to whether aluminum roof sheeting would be damaged when walked upon. However, since the use of this material is quite new, no one could give a definite answer. F. W. Hutcheson (C. & O.) stated that he had used Monel sheets for roofing and that there were no signs of rust or failure after five years of service.

Mr. Winkelhaus inquired if the bond would be waived if a railroad did repair work on a roof that was bonded for 25 to 30 years. Chairman Bunge said that the bonding company would make the repairs when required, but Mr. Winkelhaus pointed out that sometimes the railroad cannot wait until the bonding company does the work.

J. S. Hancock (D. T. & I.) warned that flashings must be carefully fastened at the edge by nailing or welding or the wind would tear them loose.

J. L. Dougherty (W. Md.) stated that the first signs of deterioration in a roof are cracks in the surface. Before applying new roofing he cleans the old surface, being careful to get the dirt out of the cracks. He then covers the crack with pieces of 15-lb. felt, laid loose, after which the top coat of 15-lb. felt is applied in the usual way with an asphalt bond. By leaving the cover strips over the cracks loose, there is less probability of the cracks working into the new top layer, he explained.

J. A. Jorlett (Penna.) expressed the opinion that the cold-process method is the safest one to use. He places a barrel pump in a 50-gal. drum of the cement and sprays the material on the roof. It is quick and safe, he said.

Mr. Hancock said it is not economically sound to apply a 20-yr. roof on 10-yr. sheathing. He also stated that galvanized nails or brads should be used, and that roof decking should consist of salt-treated wood.

In this group from the Chesapeake & Ohio are (left to right): H. A. Boehling, Jr., asst. cost engr.; P. R. Mathews, asst. div. engr.; M. J. Hubbard, gen. supvr. b.&b.; J. H. Peterson, supvr. trk.; L. B. Hewlett, div. engr.; N. W. Hutchinson, engr. wk. equip.; H. M. Harlow, asst. gen. supvr. b.&b.

Developments in Modern Methods For Watering Passenger Coaches

Report of Committee*

W. D. Gibson
Chairman

• The subject for consideration in this report is of much concern to most railroads. There has been a concerted effort during the past few years by public health agencies, including the U. S. Public Health Service and various state and municipal bodies, toward the improvement of sanitation in public places and conveyances. That these efforts have produced results seems evident, as statistics will show that over a corresponding period of years there has been a marked reduction in typhoid, dysentry, and other diseases known to be caused by waterborne bacteria. For a number of years of this period, some railroad men looked on the effort to control the sanitation of railroad facilities as more or less of a nuisance, and only in recent years has the importance of such efforts been realized by all.

The Federal Health Service, in conjunction with various committees of railroad officers, have promulgated a manual which sets forth desired standards that should be followed in order that a safe water supply might be delivered to passenger cars and other conveyances in interstate traffic. The current manual is a publication known as "Sanitation Manual for Land and Air Conveyance Operating in Interstate Traffic," Reprint No. 2444, dated Jan. 29, 1943. In this manual there is a discussion of various types of water delivery facilities, as well as suggested arrangements in the areas where cars are to be serviced and relating to the handling of hose and other servicing equipment.

Delivery Systems

In the manual, as well as in regulations which have been set forth by many of the individual states, the overhead system of water supply, which eliminates any possibility of ground contamination, is given preference. However, most watering points on the railroads have long been established and track centers in yards are such that an overhead system is more or less prohibitive without excessive expenditures.

A few such installations have been made where conditions permitted. One railroad in the Chicago terminal area has recently made an overhead installation wherein the water line was encased in a metal jacket together with a steam line supported overhead on metal posts. Drops to service outlets were made at 75-ft. intervals, with the valves at the top, and with extended operating handles conveniently located and attached to the

*Chairman of this committee was W. D. Gibson, water service engineer, Chicago, Burlington & Quincy; vice-chairmen were H. M. Dick, master carpenter, Pennsylvania, Columbus, Ohio, and T. M. Von Sprecken, assistant to chief engineer, Southern, Washington, D.C.

This group includes four railroad men and four supply men. They are (left to right): F. A. Hess, div. engr., I. H. B.; Leo E. Flinn, Dearborn Chemical Co.; Frank J. Meyer, Philadelphia Steel & Wire Corp.; F. H. Simpson, engr. m.w., N. Y. C.; Geo. H. Provancha, office asst., N. Y. C.; F. G. Frederick, asst. div. engr., I. H. B.; C. C. Rausch, Dearborn Chemical Co.; G. R. Betts, Armco Drainage & Metal Prod., Inc.

supporting posts. Track centers approximated 30 ft. This installation is reported to be working satisfactorily and has received favorable comment from the interested authorities.

Post-type hydrants served by underground supply, without sub-grade drain openings, are also given preference. Underground drainage connections of any sort are frowned upon unless they are connected to an individual drainage system used exclusively for the drainage from the hydrants, and are so arranged that the outlet, either by gravity or pumpage, is entirely free from the possibility of any contact with contaminated water.

Hydrant Drainage

It is assumed that all necessary precautions have been taken to be sure that a safe supply is available up to the structure through which the water is to be delivered to the car. From this point on, decided improvements have been considered necessary. Most railroads, particularly those operating in northern climates where freezing weather is encountered, find it necessary to use a type of coach-watering hydrant which will permit drainage of the riser pipe after the valve has been closed. Generally the drainage from the bottom of these hydrants has been either to surrounding ground or to a sewer or drain.

Early in the study of the possibility of preventing the contamination of water supplies, it was determined that the most prolific source of such contamination was from bacteria entering the water stream through the drainage or weep holes of the hydrant valves. Some might question how water from contaminated sources can gain access to a pipe line that is under pressure. Such however, is readily possible as a result of syphonage produced by a vacuum in the supply line, which could be created by repair work or possibly heavy pumpage in the vicinity in case of a fire. Also, it has been clearly demonstrated that an aspiration effect can take place when a stop and waste valve is in the forward flow position, and could be drawing some of the surrounding, and possibly contaminated, waste into the ports of the valve.

Inasmuch as the greatest stress in the attempt to improve watering facilities has been placed on the elimination of the possibility of underground contamination, many of the manufacturers of ground-type hydrants have developed and are continually experimenting with hydrants which eliminate the need for an underground drainage connection.

The need for improvement in coach-watering hydrants and attendent accessories has been further increased by the accelerated program of modernization of passenger train equipment that has taken place during the past few years. Train schedules have been speeded up, and it has become more important that facilities, particularly at intermediate points, be available to service trains quickly with drinking water. In many cases larger tanks have been installed on the newer passenger cars to reduce the number of times during a trip that it may be necessary to replenish the water supply. For example, on two groups of new trains recently constructed, water storage tanks holding over 500 gal. have been installed, compared with tanks of about 150 gal. capacity on older conventional cars. This makes it mandatory that, to fill these storage tanks in minimum time, and thus avoid delays to trains, larger capacity watering equipment be provided.

On the new trains referred to, it was decided to provide zeolite-softened water for lavatory purposes. To obtain the approval of the Public Health Service for such an installation, it was necessary to provide an auxiliary tank connected to the main supply tank but with outlets only to the lavatories. The treatment is provided by zeolite contained in nylon bags, and the regeneration is done by the removal of these bags at the end of the trip.

New Developments in Hydrants

Among the more recently developed types of coach-watering hydrants devised to eliminate underground drainage connections are those which operate on an ejector basis, in which drainage from the riser pipe of the hydrant is collected in an underground tank attached to the hydrant, and then ejected at the subsequent use of the hydrant. Many hydrants of this type have worked out quite satisfactorily when operated properly. However, there have been cases where it was necessary to use longer lengths of hose than was recommended by the manufacturers, with the result that the ejector principle did not prove entirely satisfactory and freezing of the hydrants resulted.

The type of hydrant employing the old principle of heating the riser pipe has come into more prominent use recently. This involves the use of an outer pipe casing, with an insulating material and an electric strip heater surrounding the riser pipe. Any number of hydrants, from one up to seven or eight, can be controlled by one thermostat centrally located, permitting any desired temperature.

Another method developed recently, and so far applicable only to post-type hydrants, consists of an expandable section of a rubber compound riser tubing inside of a larger metal pipe, which permits freezing without destruction of any equipment. The idea behind this design is that if freezing does occur in the riser tubing, when the hydrant is turned on the ice either melts or is discharged from the outlet which terminates in a long arc especially for the purpose. Several of these hydrants have been installed in an experimental manner and fairly satisfactory results are reported.

Still another innovation, not as yet thoroughly tested, is the use of two riser pipes instead of one; these pipes being of different diameters, and tending by circulation to prevent freezing. This method presumably would work more satisfactorily where the hydrants are directly and closely connected with a single supply line in which the water is moving most of the time.

Another method which has been reported utilizes air pressure to activate the valve and shut off the water and remove the water from the pipe near the surface so as to prevent freezing.

Platform-Type Hydrants

Practically all of the types of hydrants referred to above have been constructed as post-type hydrants and have not added a great deal to solving the problems of many railroads where it is necessary to use platform and flush-type hydrants at intermediate stations where track conditions are such that it is impossible to use post-type hydrants. It is quite possible, however, that certain adaptations of the newer arrangements can be worked out so that the platform hydrants can be retained where necessary.

In several cases which have come to our attention, roads have separated drainage from a group of existing platform hydrants and have diverted it into a sump in which was installed an automatically operated sump pump. This pump discharges the drainage water through an air gap into an existing storm sewer. This

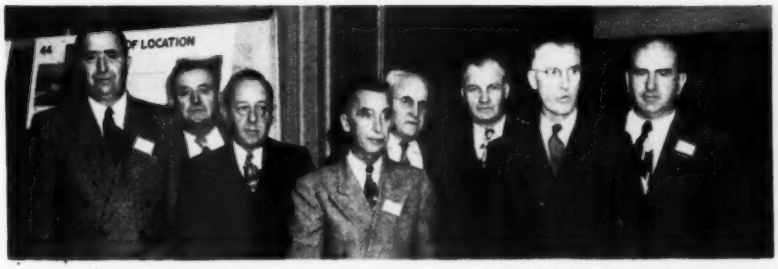
arrangement, adapted from an existing drainage system, has proved very satisfactory and was installed quite economically. A new system built along this line would probably be of exhorbitant cost.

One decided improvement has been made in connection with more recent installations of post-type hydrants, wherein some rather ingeniously designed hinged covers have been developed which automatically drop when the hose is removed, protecting the outlet against splash from surrounding sources.

There have not been many new developments involving the hose which is used in watering cars. Perhaps this is partially due to the fact that there are so many different types of car connections. The discharge end of the hose is required to be protected by a disc, which is intended to prevent the nozzle from coming in contact with contamination from the ground or platform.

There is a new type of disc which has liklihood of demonstrating value. It is in the shape of a truncated cone with an outside diameter of only about four inches, and with the large diameter around the nozzle outlet.

Some experimentation has been done with a spring-loaded cap to fit over the end of the hose nozzle, and attached by a chain to the disc itself. This arrangement seems to have merit, as does a section of white gum rubber hose for use as a nozzle beyond the protective disc. This flexible nozzle is of value where slip-on connections are made to cars, and also for insertion in underslung tanks.



These representatives of the Boston & Maine are (left to right): J. S. Andrews, supvr. welding; F. H. Mason, trk. supvr.; C. J. Benson, trk. suprv.; L. L. Davis, trk. supvr.; H. S. Ashley, asst. engr. m.w.; H. B. Richardson, supvr. b.&b.; C. L. Fero, supvr. wk. equip.; F. R. Spofford, asst. div. engr.

In conclusion, attention is called to the fact that the use of any of the newer watering devices should first be cleared with local and state health authorities and if necessary, with the federal people. It is generally not the practice to give blanket approval to any device, but rather to consider each installation on its merits, as certain types of hydrants are approved in many states and not in others.

DISCUSSION

Chairman Gibson began the discussion by saying that, although the committee report was prepared in cooperation with Mr. Darby of the Sanitary Engineering division of the United States Public Health Service in Washington, he wanted to stress that part which states that no general plan or layout can be set up as a model for all installations, because the Washington office insists upon considering each installation separately. In general, Mr. Gibson said, the federal authorities will go along in approving a proposed installation if the state authorities have approved it first.

G. Walker (M. P.) said he had found the state authorities very cooperative and accommodating. When his railroad presented plans for hydrant installations which didn't quite meet the specifications, the state authorities would advise what changes were required to make them satisfactory.

President Barnhart said that, of 69 hydrants that he is installing, all but five are of the platform type, and it is this type that the federal authorities are most reluctant to approve. Also, he said, because of the speed with which trains must be serviced and the large-capacity tanks which must be filled, it is imperative that hydrants of a larger size be manufactured.

Safety in Transportation of Men and Materials

Report of Committee*

• This subject will be treated from the standpoint of transporting the forces and materials used in maintenance-of-way and structures work. The evolution of present-day vehicles for the transportation of men and materials is familiar to those whose experience dates back to the 1900's and to those who read reports and articles such as this. The three types of transportation considered in this report are:

(1) Work trains
(2) Motor cars, push cars and trailers
(3) Automotive vehicles

J. M. Giles
Chairman

Work Trains

The cardinal rule to instill in the minds of all those whose duties lie in or about work trains is that there must be a central head to direct the movement. The roadmaster, bridge supervisor, or foreman in charge must first establish with members of the train and engine crews that:

(a) All signals for movement of the work train must be given by a member of the train crew after an understanding with the Supervisor in charge or his delegated representative.

(b) Sufficient foremen or representatives must know that all men under their supervision are in places of safety before the signal is given to move the train.

Safe work-train performance from the standpoint of the maintenance-of-way forces depends upon planning and a mutual understanding as to what work will be done.

Material to be transported by work train must be loaded in a secure manner. Close study of the loading rules applying to company material will pay dividends. It is up to the supervisor to follow these rules carefully when company material is loaded for train haul. Personal injuries and damaged structures result when one assumes that company material is not subject to shifting and other

*Chairman of this committee was J. M. Giles, assistant engineer, Missouri Pacific, St. Louis, Mo.; vice-chairmen were E. H. Blewer, supervising safety engineer, New York Central, New York; and N. H. Williams, bridge and building supervisor, Delaware & Hudson, Oneonta, N. Y.

A group from the St. Louis-San Francisco. Another Frisco group is shown on page 1099. The men shown here (left to right) are: H. M. Booth, div. engr.; E. V. Buster, rdm.; C. E. Wallace, gen. fore. b.&b. and w.s.; G. L. Harris, div. engr.; E. L. Collette, div.. engr.; H. F. Busch, div. engr.; G. E. Warfel, asst. rdm.; W. H. Pryor, gen. fore. b.&b. and w.s.; E. M. Cheatham, rdm.; Abner Hamm, rdm.; M. L. White, rdm.

conditions which create a hazard of accident.

Roadway machines must be blocked when loaded, and loading rules followed to insure safe handling in train haul. Time spent in securing loads with wire and stakes is well spent. The material and labor involved in securing loads are cheap compared with the disruption of traffic and personal injuries that might result from improper loading.

Motor Cars, Push Cars and Trailers

It is presumed in this discussion that motor cars, push cars and trailers are given authority to occupy operated tracks by management through the use of appropriate rules.

Requirements of operation must be met with a "must do" attitude. One who violates rules is substituting his judgment for the judgment and experience of 100 years of railroad experience bound in a book called "Rules".

The selection of motor cars for various types of work is the result of careful study. Changing cars to a type of service other than that originally assigned requires judgment. Overloading and insufficient braking power are factors contributing to motor-car accidents.

Transporting Men

Men being transported by motor car and trailers must be provided with seating space. The transportation of men on push cars, whether light or loaded, is conducive to accident. Speed in excess of that prescribed by the rules is a nemesis of all safety-minded men. There is no "short time" on a railroad. One either has time to go to a certain point at a certain speed, as prescribed by the rules, or has the alternative of staying off the track until he does have that margin of time to complete his journey safely.

The requisite for safe transportation of men and materials by motor car, push car and trailer is strict compliance with rules of the service. Understanding and correction of material defects by a competent inspector, and follow-up to see that the defects are corrected before the vehicle resumes operation, comprise a "must" procedure.

Automotive Vehicles

The automotive vehicle is one of the newer means for the transportation of men and materials in maintenance-of-way service. Like other machines, man must be master of it, or it becomes an enemy to safe operation.

Automotive vehicles assigned to maintenance-of-way service must be carefully selected for the type of service intended. Operators of such vehicles must be selected for their mature judgment and a sense of responsibility for the safety of those entrusted to their care. Knowledge of customs, laws and conditions peculiar to operating location are necessary for safe operation.

Vehicle inspection reports that burden the operator and supervisor with unnecessary data are worthless. Inspection reports must be concise, direct, and the result of an actual inspection of a vehicle by a qualified inspector. Defects as noted by the inspector must be corrected before a vehicle is returned to service.

The foreman in charge of truck operations must be versed in the rules for loading vehicles for highway transportation. Legal requirements as to weight, height, and width must be known and complied with.

Seating Arrangements

As in work-train and motor car operation, an understanding must be had between the operator and the man in charge before the vehicle is moved. Seating space must be provided for all men being transported by automotive vehicle. The practice of permitting limbs to protrude over the end gates and sides of vehicles sets up a potential hazard of accident.

Over driving lights are responsible for most accidents occurring after sunset. Frequent contact with automotive vehicle manufacturers and service men will be beneficial. New methods of operation and new safety devices are being provided for vehicles and it is well to keep abreast of these changes in order to benefit from the experience of others.

Conclusions

The foregoing is a summation of some of the experiences of men engaged in the transportation of men and materials engaged in the maintenance of way and structures on American railroads.

Safety from the many angles of railroading is the result of careful programming of the work involved, and close contact between the supervisor and men engaged in the work. The open-door policy between supervisor, foremen and men invites a free discussion of the problems confronting all railroad supervisors today. Many suggestions, after careful weighing, are discarded. However, out of the suggestions made, one may be adopted which will result in a "better working-day home" for employees engaged in maintenance-of-way service on the railroads.

DISCUSSION

The discussion was begun by J. R. Showalter (M. P.) who cited an instance where several men were hurt when their motor car was run over a railroad grade crossing at more than 15 m.p.h.

J. L. Holmes (N. Y. N. H. & H.) raised the question whether it is the custom on other roads to keep the tailboard up on trucks when carrying men. He said his road permitted the tailboard to be down but that a safety chain was provided to prevent men from falling off. T. M. von Sprecken (Sou.) said he was not in favor of letting men ride on vehicles with their feet hanging down in the rear or with their arms out. He added that men on his road are not permitted to ride motor-car trailers when they are being pushed, nor are they permitted to ride on a water barrel being carried on a push car. He emphasized that foremen must enforce prevailing safety rules or the men would fall into unsafe habits.

Running Motor Cars Backwards

P. F. Huston (C. & S.) said that on his road there is a rule against running motor cars backwards at speeds in excess of 5 m.p.h. and that the operation of cars in reverse was permissible only when moving to set-offs. President Barnhart stated that backing up a motor car is a dangerous practice. He cited an instance where a water keg fell off while this was being done, derailing the car and causing five men to be hurt.

Chairman Giles stated that only one truck out of the 16 assigned to him had been involved in an accident. Guy Martin (I. C.) added that experience with trucks on his road showed that the panel-type truck was not as safe as the open-top type. Mr. Holmes stated that he pre-

ferred trucks to motor cars because of their greater convenience and speed in getting out to the job site.

Mr. Huston suggested that the committee report be revised to state that any person may give a "stop" signal when controlling train movements, but that only a member of the train crew should be authorized to give the "proceed" signal. W. H. Vance (M. P.-retired) said that he agreed with Mr. Huston, but that he had found that the supervisors were the greatest offenders in violating this safety concept. He believes that they should comply with this understanding and thus set an example for the foremen. G. J. Bass (G. C. & S. F.) stated that he was not in accord with Mr. Huston and that he believes foremen and not the trainmen should give the signals, particularly when spotting a pile driver for driving piles. Mr. Huston replied by saying that, even for this operation, it would be more desirable to have only a trainman give the signals as directed by the foreman.

Shown here is a group from the Missouri Pacific. They are (left to right): C. R. DuBose, res. engr.; W. A. Huckstep, gen. bldg. supvr.; Lee Mayfield, res. engr.; J. R. Showalter, br. engr.; A. A. Hampton, asst. b.&b. supvr.; W. H. Bunge, asst. engr.; J. M. Giles, asst. engr. road mach.; E. L. Denman, rdm.

Prolonging the Life of Ties on Bridges and Trestles

Report of Committee*

H. D. Curie
Chairman

• This is becoming a more important subject every day for the consideration of supervisory forces in bridge work. It is very important in the matter of conservation of our natural resources as the available supply of good timber is becoming depleted at an alarming rate. The cost of bridge ties installed is a very important item in the maintenance of bridges.

The first important step to be taken by supervisory forces is the proper maintenance of existing decks. Many years can be added to the life of a deck by prompt action to remedy defects in a deck as soon as they develop. Once a defect develops in a deck, such as a crushed or split tie, additional stress is thrown on adjacent ties and they, in turn, become damaged. In decks that have a large percentage of good ties, a defective tie should be renewed promptly to avoid damage to the remainder of the ties.

Ties with longitudinal splits can sometimes be saved by bolting the pieces together. Surface defects caused by plates cutting into ties can be corrected by the use of an iron filing compound under the plate where plate is pocketed, or the use of a hardwood shim. Spikes which become loose should be removed and the holes plugged with treated tie plugs before spikes are redriven.

In the event that it becomes necessary to renew a number of failed ties in a deck that shows mechanical wear, and crushing under tie plates, it is considered good practice to renew a certain number of ties out-of-face on one end of the deck, and use the salvaged ties to replace defective ties in the remainder of deck. This gives a better riding condition than is obtained when new ties are spotted in among ties which have crushed or softened under plates. Ties that become badly checked or split can be saved from decay by filling checks or cracks with tar or plastic compound.

The life of a deck can be extended materially by the maintenance of good line and surface on the bridge and approaches. This feature should be checked at periodic intervals and any defects found corrected promptly.

Good maintenance of rail joints is very essential to the life of ties, as loose or battered joints will soon cause ties to be damaged by mechanical wear. Once mechanical wear starts it presents a formidable problem to overcome.

The fire losses resulting from fires on bridge decks amount to more than one million dollars a year in the United States. Fire losses can be greatly reduced by the use of sheet metal coverings over decks. In some cases an asphaltic base compound has been spread on the ties and then covered with a coating of sand, stone screenings or fine gravel. It has been found that ties which have been coated with the various compounds, will resist fire action much better than ties which have not been coated. In the event a fire should start on a deck thus treated, the rate of buring is much slower in the coated ties.

The use of metal or asbestos cement board as fire stops at intervals on the longer decks has been successful in reducing fire damage.

In older decks, where shattering of the grain of ties starts, these surfaces should be adzed smooth. Also, bad checks and splits should be filled with an asphalt compound and covered with sand or gravel. On creosoted decks, where extremely hot weather causes the oil to boil to the surface of the tie, dry cement swept or dusted on these surfaces will usually form a slightly hard protective coating which is fire resistant. A tie with heavy creosote treatment is very susceptible to fire damage and will burn rapidly.

The use of salt solutions in the treatment of bridge ties has been tried as an aid to fire prevention. Ties thus treated are much more resistant to fire and have a much slower burning rate than those treated with creosote solutions. Although the salt-treated tie is much more fire resistant, the life of such ties is only about one-half the life of creosote-treated ties. This is due to leaching of the salts.

The use of creosote solutions for the treatment of ties has proven more successful than any other treatment from the standpoint of life in years, even though the fire risk is greater.

There are treated decks that have to be renewed which will yield enough good salvage ties to renew decks on unimpor-

*Chairman of this committee was H. D. Curie, master carpenter, Baltimore & Ohio, Garrett, Ind.; vice-chairman was H. Jenkins, assistant division engineer, New York, New Haven & Hartford, Boston, Mass.

Shown here is a group from the Baltimore & Ohio. They are (left to right): M. M. Gerber, cost engr. (B. & O. C. T.); W. C. Bolin, account. engr. (B. & O. C. T.); H. D. Curie, mast. carp.; R. W. Gilmore, gen. br. insp.; E. H. Barnhart, div. engr.; M. S. Norris, asst. engr.; O. G. Todd, asst. div. engr.

tant bridges and trestles on branch lines where traffic is light and movements slow. These ties can be reframed and will give a number of years of service, although, generally speaking, secondhand salvage ties can be used as cribbing, blocking, etc., to much better advantage.

Auxiliary Deck Repairs

When it becomes necessary to renew a deck of ties, consideration should be given to taking care of any steel repairs to cover plates, lateral plates and angles, or any other repairs which would necessitate the moving of ties, etc., as this is usually injurious to the ties.

Inaccessible parts of a bridge under ties should also be thoroughly cleaned and painted before placement of the new deck. If this work is done there will be very little necessity for disturbing the ties for a number of years.

It is a well-known fact that the line and surface of the track on the bridge and approaches have considerable bearing upon the life of a deck. This is particularly true of the approaches, for if the track is not kept well tamped on the approaches, it will only be a short time until the backwall tie and end ties on the bridge will show considerable mechanical wear and crushing; also, if the line is poor, there will be a tendency for the tie plates to cut into the tie and for the spikes to become loose.

When steel repairs, cleaning and painting are completed, the bearings for the ties must be brought up to a true surface. Bearing surfaces on masonry should be checked and any necessary repairs made.

The alinement of track over a bridge should be thoroughly checked and the track relined, if necessary. The best results are obtained by using an instrument and correcting the line before the new ties are placed, as there is a tendency to slight the line if this is done at the time new ties are placed. Also, considerable traffic delay can result by trying to correct line at the time new ties are placed.

The first important step is the selection of timber for use as bridge ties. Timber should preferably be straight grained, free of large knots, shakes, and splits. It should be well seasoned before treatment. Hardwood has a tendency to split and check more easily than softwoods. The use of variously shaped irons driven into the ends of ties tends to reduce splitting Much of the trouble experienced recently by short life in bridge ties has been due to the lack of adequate seasoning of the timber before treatment Timber not fully seasoned and containing moisture will not last much longer after treatment than untreated timber which has been fully seasoned before use.

All timber for ties should be well seasoned and treated, as an untreated tie, or one improperly treated, with a life of 10 years, is much more expensive than a treated tie with a life of 20 years or more. The labor cost of installation is practically the same for either kind of tie.

The size and spacing of the tie are very important factors. An under-sized tie will develop checks, splits and crushing at bearings. Inadequate bearings will increase mechanical wear. The depth of a tie depends upon the distance of center to center of bearing points. The greater the distance, the deeper the tie that will be needed. On bridges where there are several cover plates that do not extend the full length of the span, ties of different depth should be used instead of having deep daps on one size of tie. Deep daps in ties tend to cause shear cracks and splitting on the underside of the ties. Where elevation ties are used on curves, the daps should be parallel with the grain. The width of the tie should not be greater than the width of tie plate. With wide ties, water pockets develop under the plates.

The treatment of ties has made possible the use of softer woods. Formerly, before treating became general, the life of softwood ties and ties with heavy sapwood was very short due to decay and mechanical wear. Treatment has more than doubled the life of such ties, although they are still susceptible to mechanical wear. Generally speaking, the use of such ties is much more satisfactory on timber trestles, where they have more bearing surface, than on steel bridges. This reduces the mechanical wear to the area under tie plate. This can be further reduced by the use of longer and heavier plates.

One of the important steps in preparing a tie for treatment is proper seasoning. The vapor-drying process of seasoning is supposed to reduce the amount of checking and splitting, in addition to eliminating the long seasoning period. If this method is proved commercially successful it will eliminate the stacking of ties for long seasoning periods.

When it becomes necessary to renew a deck, measurements should be taken in the field and furnished the treating plant for the proper framing before treatment. Where the bearings of ties and center line of track are in exact relation, the ties should be prebored for spikes. Reports indicate that in numerous instances, the relation between tie bearings and center line of track is such that good line can not be obtained by preboring before treatment. Usually, ties used on trestles can be prebored.

On bridges where there are rivet heads on the bearings, the ties, especially hardwood, should be predapped for the rivet heads. Where there are more than two lines of rivets on a bearing, unless the bearing is extra wide, ties should not be predapped for rivets as too much bearing surface would be lost. In this case the ties should be bored in the field for rivet heads or allowed to seat under traffic. There is some objection to seating hardwood ties on rivets under traffic account of loosening rivets.

Timber guard rails can either be framed and prebored before treatment or this work can be done in the field. If done in the field proper precaution should be taken to see that holes are treated and joints painted with creosote oil. Generally the dapping of timber guard rail has been eliminated by the use of fastenings between the ties and guard rail.

In placing new ties on bridges or trestles, great care should be exercised in the handling of them so that they are not dropped and become badly bruised or split. The use of maul on ties to seat them should be prohibited. Ties should be placed in proper position before spiking or fastening guard rails. Ties that are improperly placed, or tie plates and rail not lined before spiking, will result in fastenings having to be removed to correct these conditions. Whenever spikes have to be redriven in ties, even though the holes are properly plugged, the life of the tie is generally shortened by several years.

Mechanical Wear

Mechanical wear under tie plates and the resultant decay around the spikes, take the greater toll of bridge ties. If this can be eliminated, many years can be added to the life of ties. In recent years a number of tie pads have been placed on the market for use between ties and tie plates. It is claimed that these pads reduce abrasive action, cushion impact loads, thereby reducing splits and checks in the ties, and assist in maintaining true line. Net savings of 25 to 100 per cent of installed cost of bridge ties are claimed. These pads have not generally been under actual test long enough for the results to be conclusive. Reports in-

dicate that some pads are too hard and show considerable wear in a few years. Others tend to shatter and absorb moisture rather than resist it. Reports indicate that a pad of somewhat tacky composition will form a better seal around spikes, also between plate and tie, thereby keeping out moisture. A pad of this type should prove to be more beneficial than harder types of pads.

Briefly, the main points to be considered in prolonging the life of bridge and trestle ties are as follows:—

(1) Necessary repairs to tie bearings before placement of ties.

(2) Good grade of timber, preframed and treated.

(3) Properly placed in true line and surface.

(4) Well fastened to prevent movement.

(5) Proper maintenance of approaches.

(6) Frequent inspection for crushing, splitting, decay and condition of line and surface.

(7) Prompt action to remedy defects.

(8) Proper fire protection maintained.

The life span of a bridge or trestle tie is largely determined by the quality of material, workmanship and maintenance. Poor material, workmanship and maintenance result in a very short life. Good quality material, workmanship and maintenance will result in a much longer and more satisfactory life span. This is the responsibility of bridge supervision.

From the Illinois Central came (left to right): G. E. Martin, supt. w.s.; C. D. Turley, engr. ties and treat.; C. M. Chumley, engr. m.w.; M. Block, engr. br.; E. A. Johnson, asst. to br. engr.; J. E. Fanning, asst. to ch. engr.; A. A. Shillander, asst. engr.

DISCUSSION

H. M. Harlow (C. & O.) raised a question regarding the use of tie pads for lengthening the life of ties. M. Block (I. C.) stated that tie pads had proved very effective on his road and cited an example of their use on a bridge where the ties had become badly cut by the tie plates. The bridge was that over the Ohio river at Cairo, Ill., which is located on a 4-deg. 45-min. curve. Since tie pads were installed more than five years ago, the ties show no apparent change, said Mr. Block. T. M. .von Sprecken (Sou.) said his road is experimenting with tie pads but that they have not been in service long enough to determine their merits.

F. G. Campbell (E. J. & E.) took issue with the statement in the report that "timber not fully seasoned and containing moisture will not last much longer after treatment than untreated timber which has been seasoned before use", saying he believes that even green timber, when treated, will last longer than untreated material.

Chairman Curie stated that one member of his committee wanted the report to recommend the use of lag screws as anchor spikes to reduce mechanical wear of ties. However, the committee as a whole was of the opinion that this practice was too expensive to recommend. J. A. Jorlett (Penna.) said his road changed from lag screws to drive spikes because it was found that the men were using the screw spikes the same as drive spikes.

Pier Construction and Maintenance of Waterfront Terminals

Report of Committee*

F. W. Hutcheson
Chairman

• The importance of adequate and properly maintained waterfront facilities was clearly brought to our attention during the days of World War II. These facilities are of equal importance in times of peace. Much of the operating revenues of our various railroad systems is derived from the handling of both export and import commodities to and from our waterfront terminals. Proper design and good maintenance of such terminals tend to lower handlings costs, while obsolete design and improper maintenance result in higher wharfage costs. This is equally true with respect to inland waterway terminals.

In many instances the piers and appurtances of various waterfront terminal are either municipally or privately owned, being leased to the particular railroad which serves them. A number of such terminals are owned and maintained by railroad companies. Generally, leased facilities are maintained by the railroads.

Until recent years, the general type of pier construction consisted of a timber pile substructure, with a timber shed. In some cases, however, steel superstructures were used on timber substructures. During the past few decades there has been a very definite trend toward the use of pre-cast concrete piling for the supporting members, with various combinations of timber and steel for the remainder of the structure. In some cases concrete has been used for the entire structure. Another type of construction involves the use of creosoted timber piles capped at about mean low water and concrete or timber plank installed thereon. This may be used to support an earth fill for land track installation, or the superstructure of a pier shed as well as tracks.

Tubular Steel Piles

Use has been made of tubular steel piles, filled with concrete, in the construction of at least one pier on the West

*Chairman of this committee was F. W. Hutcheson, supervisor bridges and buildings, Chesapeake & Ohio, Newport News, Va.; vice-chairman was J. J. Winn, supervisor bridges and buildings, Boston & Maine, Boston, Mass.

These men from the Atchison, Topeka & Santa Fe are (left to right): C. H. Sandberg, asst. br. engr.; R. A. Van Ness, br. engr. sys.; W. F. Martens, supvr. salvage; G. J. Bass, gen. fore. b.&b. and w.s. (G. C. & S. F.): F. E. Schneider, asst. engr.

coast (Long Beach, Cal.), and also one on the East coast (Hampton Roads, Va.), the latter being owned and operated by the U. S. Navy. These installations are considered an innovation in pier construction, as they represent the first times that tubular steel piles have been used to any great extent in salt water.

One of the outstanding advantages in the use of this type of pile is the ease with which the length can be altered in the field. Low clearance problems can be overcome by driving the piles in short sections and welding the joints in such a manner as to make the splice equally as strong as the remainder of the pile.

In designing and constructing any pier structure at which ships and barges are to be docked, provision should be made for an adequate fender system. This is especially true in the case of concrete structures. If the concrete structure is of sufficient width to absorb the stresses resulting from docking operations, timber and piles may be attached directly to the concrete pier by means of tee bolts secured to cast iron inserts which have been previously imbedded in the concrete. When this type is not feasible, it becomes necessary to install a complete timber system which will be entirely independent of the concrete portion of the structure. The width of these independent systems is limited to a minimum of approximately six feet, as it is impossible to make them stable with a lesser width.

Another development of recent years in connection with fender systems is the use of radial or rounded corners on the outshore ends of piers to replace the conventional square corners with pile clusters or dolphins for protection. The radial corner receives its strength from a series of diagonal walers and vertical piles, with the walers located at low water elevation and also just below the floor system of the pier apron. By means of ranger timbers this construction is made an integral part of the apron structure. It is usually protected on the outside by fender piles driven closely together, and at the point of curvature lining up with the end and side fender systems. Thus there is no protruding obstruction in the entire line of the fender system and ships may be docked with less possibility of damage to hull plates, and also with greater ease on the part of the tugs.

Careful consideration should be given to plans and specifications for new structures, as future maintenance will be governed in large measure by these factors. Local conditions and requirements vary to a great extent, and each project must take these into consideration. The present high construction costs make it imperative that all materials be selected carefully, giving due consideration to durability and permanence.

Several investigations have been made as to the durability of concrete in seawater. The general conclusion of these investigations are that the three most important requisites for concrete subject to such water are: (1) A well-designed mix capable of producing an impervious concrete, (2) careful construction methods to prevent segregation and honeycombing, and (3) proper curing methods. If these requisites are complied with, durable concrete can be produced for exposure to seawater. Air-entrained concrete improves its durability in seawater when subjected to freezing and thawing. Successful use has been made of high-early-strength cement in precasting concrete piles for use in seawater.

Timber Piles

Timber piles are still widely used for the substructures of waterfront facilities. It is recommended that a thorough creosote treatment be given all piles used in such service, especially those to be used in areas infested with marine borers. American Wood-Preservers' Association specifications for marine piling are available. The protection of wood piles against marine borers is a problem, and much investigation work to minimize this problem is being carried on. Protection of the pile cut-off is of extreme importance. Other sub-structure timbers, such as bracing, caps and deck stringers, should be treated with creosote and preframed and bored before treatment.

In designing superstructures, recent development in timber treatment with fire-retardant salts give the designer a construction material with qualities which very definitely reduce fire hazards. These salts are subject to some leaching when exposed to the weather, but are satisfactory for interior installations. Some of these fire retardant salts afford protection against decay.

Use is being made by some railroads of greenheart piling and sawn timber originating in South America, for both construction and maintenance purposes. This wood requires no treatment against decay or marine borers and hence can be framed on the job without penalizing its service life. The cost of this timber, however, is greater than that of native woods.

Several installations of greenheart piles have been made during the past few years, chiefly for pier fender systems and ferry slips. One railroad has recently constructed a new concrete coal pier with independent fender system constructed entirely of greenheart piles and timber.

Maintenance

The replacement of timber-pile substructures is probably the most costly item of pier maintenance. An out-of-face renewal occurs only every 25 to 35 years. In the case of open-deck piers or other structures not involving sheds, the problem is a comparatively easy one. There are three possible methods to be used where sheds are involved. One is to remove the shed to permit the use of pile-driving equipment. The second provides for cutting holes in the roof and driving the piles with floating equipment. There are certain limitations to this method in that the width of the pier cannot be more than twice the working distance of the pile driver boom. This method is particularly adaptable to spot renewals. The third method involves the driving of splice piles with a rig that operates beneath the roof structure and which eliminates disturbing the roof. This method is not too strongly recommended, but, if used, care should be exercised to make sure the splices are well below the mud line.

Underwater inspections should be made periodically of structures with timber pile foundations. The frequency of these inspections will be governed by the rate of infestation of marine borers. The use of test boards indicates the rate of this infestation.

It has not yet been possible to develop perfect casting and driving methods for precast concrete piles, with the result that it often becomes necessary after a varying period of time to restore a portion or all of the piles in a particular structure. The movement of ice in the northern areas, as well as harbor water pollution in may locations, are also factors that have a definite bearing on the durability of concrete piles.

A large eastern railroad is now in the process of restoring approximately one thousand 15-in. disintegrated square piles. The work is being accomplished by the use of floating steel caissons 4 ft.

square, 5 ft. 6 in. deep, and divided in half vertically. These halves are attached to individual piles in pairs with the bottom approximately three feet below mean low water, by means of a closing device which clamps tightly against the pile. All joints are sealed with strips of sponge rubber.

The caissons are then dewatered and the piles are ready for cleaning and the removal of all disintegrated concrete. If any of the original reinforcing steel has deteriorated it is replaced and additional bars are installed for the new concrete section. A complete wrap of wire mesh is also used on each pile. The new concrete is applied in a 16-gauge wrought-iron form, which is 22 in. square, and made up in three sections, which provides a depth of approximately five feet.

The maintenance of decking and runways is an item of considerable importance in the operation of waterfront facilities. The majority of our present-day piers have wood decks. To protect the timber from wear, various types of overlay have been used.

Bituminous Concrete

In some locations bituminous concrete has been used as a wearing surface for pier floors. After respiking the underfloor, a first layer of coarse binder is laid two inches thick and compacted with a five-ton roller. A second layer of approximately one inch thickness, with fine aggregate, is then applied as a wearing sufrace. One such installation has given good results over a period of five years with very little maintenance, and should be serviceable for many years to come. This type floor surface is sufficiently flexible to take care of structure movements, and indentations from various causes will heal quickly with traffic movements. A new concrete merchandise pier recently erected in the port of Hampton Roads, Va., has a one-inch wearing surface of bituminous material laid over the concrete deck.

Good results have been obtained from the use of one-inch asphalt planking applied over heavy timber deck. The average life of the asphalt planking is from 12 to 15 eyars. The sub-floor in this type of installation will last almost indefinitely, provided it is protected from moisture. This means that it should be confined to inside use, unless the sub-floor material has been treated.

Steel plate is sometimes used as a runway. It has been found that a ⅜-in. thickness is the minimum that should be used for best results. Both sides should be beveled to permit the easy mounting of trailer and tractor wheels during trucking operations.

Native hardwood for decking have given very good results. Treated black gum provides a good wearing surface. Some inside installations have been in existance for 13 years. Soft woods are not recommended for decking purposes unless protected by an overlay of some type.

Sawed greenheart planking, and Mora, another South American hardwood, have also been used for decks. Both must be well secured to the deck stringers to prevent warping and buckling. An outside installation of greenheart has been in existance for 14 years and subjected to heavy trucking, with very little sign of wear and no sign of decay. The greater strength of these materials permits the use of planking from one to two inches thinner than would be required for oak, pine or other similar woods.

Pier roofs are usually of the built-up type, either four or five ply, with gravel or slag surface. All roofs should be maintained in good condition in order to prevent damage to export and import merchandise.

Limited use for maintenance has been made of timber treated with fire-retardant salts, and its use would not seem practical unless an out-of-face renewal is being made. However, any measures that will tend to reduce fire hazards on waterfront properties should be considered.

Every maintenance supervisor on waterfront terminals is confronted with the problem of damage to properties by ships and other floating equipment. Such damage is more or less continuous and of varying severity. Therefore a small stock of piling and heavy timbers should be stored nearby for making any necessary repairs.

Conclusions

Waterfront terminals are costly installations from the standpoint of both construction and maintenance, and new projects should be designed with this in view.

In designing new waterfront facilities valuable engineering assistance can be secured from the U.S. Navy, as it has had wide experience in this type of construction.

Careful thought should be given to each project that involves heavy replacments to determine whether out-of-face renewal is desirable instead.

Some of the St. Louis-San Francisco men who attended the convention. A picture of another Frisco group is presented on page 1094. Shown here (left to right) are: J. W. McDonald, gen. fore. b.&b.; Virgil L. Leak, gen. fore. b.&b. and w.s.; A. N. Mathews, gen. fore. b.&b. and w.s.; E. L. Anderson, asst. ch. engr.; Clarence B. Perry, rdm.; Charles B. Bonner, rdm.

DISCUSSION

H. A. Matthews (St. L.-S. F.) raised a question regarding the difference in cost of greenheart piling and concrete piling. Chairman Hutcheson stated that the cost of concrete piling varied in accordance with the design of each railroad, but that greenheart piling costs about two dollars a lineal foot.

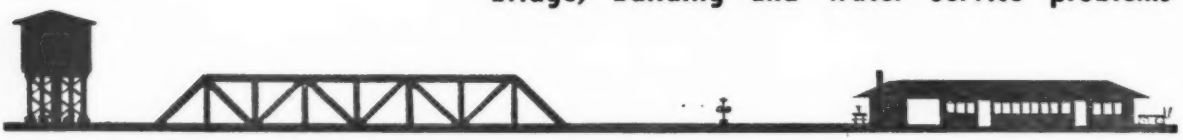
Answering a question put by Mr. Matthews regarding the kind of waterproofing to use as protection for concrete piles in sea water, Lee Mayfield (M.P.) expressed the opinion that the only kind of pile that should be used in salt water is the marine-treated creosoted wood pile. Those driven on his road have been in service only a few years but they seem free from the attach of marine borers, he said.

J. M. Salmon, Jr., (L. & N.) said his road has a pier on a concrete foundation that has been in service for 25 years. The piles are from 50 to 90 ft. long, coated with creosote, and are still in good condition, with only a few checks in the surface of the concrete over the reinforcing. He added that his road depends solely on a driver's inspection for determining the necessity for making pile renewals. W. H. Pryor (St. L.-S. F.) then asked if the L. & N. used concrete jackets for repairing concrete piles, saying that he had found that the borers worked under the jackets, causing them to fall off. Mr. Salmon agreed that concrete jackets were not practicable and said they were not being used on his road for repairs. C. M. Setzer (Sou.) said concrete piles with Gunite had proved satisfactory on his road, and that they did not shatter when driven with a 7,000-lb. Vulcan hammer.

One of the committee members stated that greenheart piles should be banded before driving to prevent them from splitting. He added that greenheart piles are so hard that a heavy blow might knock a chunk of the wood loose. For this reason, he said, such piles should be used only as inner piles and not on the outsides of pile fender clusters. Also, he said, greenheart timber plank should be fastened with screw spikes, because this species of timber has a tendency to curl.

WHAT'S THE ANSWER?

An open forum for maintenance men on track, bridge, building and water service problems



Minimizing Heaving of Track

Where can heaving track be expected during the winter months? When preparing for winter, what, if any, special precautions should be taken at these points? Explain.

Elimination Cost Justified

By H. S. ASHLEY

Assistant Engineer Maintenance of Way, Boston & Maine, Boston, Mass.

Heaving track may be expected at locations where moisture is retained in the roadbed and its extent depends on the amount of moisture present and the duration of the low temperature periods. Locations at which heaving may be expected are well known to the foreman and supervisor and certain preparations are made to prevent or reduce the severity.

Heaving cannot be entirely eliminated until water in the roadbed is removed, and corrective measures, such as adequate ditches, underdrains and suitable ballast are provided. Some relief may be had by digging out the old roadbed and replacing it with pervious materials and suitable ballast. In territories where long winters and low temperatures are encountered, heaving is a problem that warrants study, and usually the expenditure of substantial sums of money to eliminate it can be economically justified.

Each Spot May Be Different

By TRACK SUPERVISOR

The seriousness of heaving track is a relative matter. If the heaving or expansion of the saturated material below the ties is uniform, and much of it is, the fact that it has heaved goes unnoticed largely because the effect on ride and safety is small. However, when the track is raised unevenly by frost action, the riding quality is immediately reduced and safety can soon be impaired in varying degrees, dependent on conditions surrounding the heaved spot.

In my experience, frost action has caused me the most trouble: (1) Over large culverts, and masonry or concrete arches where the depth of ballast between the crown of the arch or culvert and the track was small; (2) where the water table was non-uniformly high; and (3) at water pockets.

For the first condition, I have not yet found a satisfactory solution. Good drainage and clean ballast—completely down to the arch or culvert—minimize the amount of the heave, but even then, late fall rains can leave enough moisture to cause trouble. The difficulty in these cases seems to stem from the cold penetrating the ballast section from below as well as from the top—making the freezing action more complete and faster than the surrounding area, resulting in a distinct frost hump. Although I have not yet tried it, I think there is merit in the use of asphalt impregnated ballast in such areas, to provide a "roof" over the arch or culvert area, to exclude those damaging late fall rains.

For those that may be particularly interested in the theory of frost heaving of track, as well as methods of alleviating its effect by the use of salt and track shims I would refer them to pages 205 and 206 of the 1948 edition of the **Railway Engineering & Maintenance Cyclopedia.**

Answers to the following questions are solicited from readers. They should be addressed to the What's the Answer editor, *Railway Engineering and Maintenance*, 79 W. Monroe St., Chicago 3, and reach him at least 30 days in advance of the issue in which they are to appear. An honorarium will be given for each published answer on the basis of its substance and length. Answers will appear with or without the name and title of the author, as may be requested. The editor will also welcome any questions which you may wish to have discussed.

To Be Answered In The January Issue

1. What are the relative merits of spring frogs having short spring rails and those with equal-length legs? Under what circumstances is the use of each indicated? Explain.

2. To what extent is it feasible to establish well-equipped, division or system sign painting shops, such as are maintained by many state highway departments—bringing signs, or parts of signs, to the shop, rather than paint them in the field? What are the advantages and disadvantages of the shop and field methods?

3. To what extent should roadmasters and supervisors attempt to plan in detail the daily operations of their section and extra-gang foreman? What are the factors involved?

4. When it is necessary to unload long piles from flat cars, how can this best be done to avoid possible injury to workmen? Explain.

5. Should rail ends be slotted periodically? Why? What factors determine when re-slotting should be done?

6. To what classes of water service work is welding adapted? What types of equipment are most suitable? Explain.

7. How are building materials classified as to their relative fire-retardance? To what extent can these classifications be bettered by the application of fire-retardant coatings? What type coatings are particularly effective? Explain.

Using Motor-Car Indicators

What is a motor-car indicator? What is its function? Under what circumstances can such indicators be used to good advantage? Explain.

Best Where Visibility Poor

By R. R. MANION
Engineer Maintenance of Way, Great Northern, St. Paul, Minn.

A motor-car indicator is a minature wayside signal of the electrically-operated semaphore type, interconnected with the automatic signal system in such manner as to show track occupancy by trains. The purpose of these motor-car indicators is to furnish track-car operators with information regarding the proximity of trains, but they do not confer any authority for movements nor do they modify any existing rules or instructions governing track car operation. Track-car indicators are used to the greatest advantage for showing the presence of trains in territories where the visibility is restricted to the extent that track-car operators are unable to see an approaching train at a sufficient distance to permit the removal of the car before the arrival of the train.

It is essential that all operators qualified to operate track cars in a territory where these indicators are installed be fully conversant with their limitations, so that they do not assume a security which does not exist. Indicators must be so arranged that the acceptance of a "clear" signal does not require the operator to run at excessive speed to reach a point at which a clear view may be obtained, as this would set up additional hazards of striking other track cars operating in the same territory or of striking foreign objects lying on the track.

These devices constitute an additional aid for track car operators and are not intended to take the place of other types of information. With the use of these signals, it is necessary, in addition, that the operators of track cars obtain the best train-time-and-location information available.

In the use of track-car indicators all concerned must bear in mind the time-distance factors involved in both train and track-car operation in the territory, so that an operator moving on an indication fully realizes the distance through which an approaching train may move after he has passed a track-car indicator and before he can arrive at a point of unrestricted visibility.

Assuring Safe Operation of Boilers

In what ways can water service forces help to insure the safe and efficient operation of steam heating boilers in railway buildings? Explain.

Inspect Periodically

By GEORGE S. CRITES
Division Engineer (Retired), Baltimore & Ohio, Baltimore, Md.

The 40-hr. week will add materially to the problems of safe and efficient operation of steam heating boilers in railway buildings. The attendants will be shifted more than before, and the likelihood of careless, indifferent, or just lazy attendants are multiplied. Where there are no janitors, the plea may be heard that, "I did not hire out to do janitor work."

Little trouble should arise where oil or gas are used as fuel and the heating plants have simple but proper thermostatic control. Water service forces should give such plants a thorough inspection and a trial run and be sure that all is in order before cold weather. The party or parties who are to be heated, or those who are to care for furnaces should be told how to take care of the heating system under all likely conditions. Periodic inspection by water service forces during the heating season may cut out some overtime.

There can be trouble enough and overtime aplenty where coal is the fuel. Seldom do any two persons require the same amount of heat to be comfortable during cold weather and the warm-blooded ones may leave no fire for those on the following shift. Nothing adds more to boiler troubles than to have them go dead during freezing weather, and no one is harder on a furnace than a cold, disgruntled attendant.

Problems of coal boilers, or furnaces, can be met, but not all at once, by installing stokers with simple thermostatic controls. Where such systems are in use, the water service forces should make the same inspections and issue similar instructions as they would for oil or gas installations.

The boilers that have no stokers or heat control systems will give trouble. To some extent this may be met by contracting with local plumbers to inspect and repair heating systems where the expense might be greater if done by the regular water services forces, but contract procedure is sometimes abused. In some places, a regular attendant for coal-burning boilers may be contracted for, but this may cause trouble too. The contractor may get sick or throw up his contract during a blizzard. The paying of a stipend to a regular worker for caring for coal heating plants does not work well because there are two days he does not work and the extra shift workers may not care for any stipend for taking care of fires.

As resolved, the problems break down into four things that can be done: (1) Continue using, or convert to, oil or gas with adequate heat control systems; (2) convert antiquated coal burners to stokers controlled by thermostats; (3) trial test and periodically inspect all heating plants; and (4) pray for a mild winter.

Check Unattended Stations

By WATER SERVICE FOREMAN

One of the best ways in which water service forces can help to insure the safe and efficient operation of heating boilers in stations and other buildings is by thorough inspection and repair of all heating equipment well in advance of cold weather. This inspection should not be confined to the furnace and boiler itself, but should include radiators, piping, and insulation.

In view of the changed conditions that have been brought about by the 40-hr. week, I think our supervisory officers should carefully check the heating facilities of each location where station forces are being either reduced or eliminated over week-ends. In some cases the present facilities may be adequate to meet the new conditions of use, while in others, some alterations may be necessary.

Although most of our stations that have been equipped with steam heating facilities are important enough to require that employees be on duty during week ends, there is the possibility that the station forces will be reduced to an extent that will means less attention being given to heating boilers.

Where this is probable I think consideration should be given to altering the heating facilities so as to make them as nearly automatic as possible. One of the first things that can be done in this regard is to install boiler water-level controls. These controls are generally designed to maintain one inch of water in the gage glass, automatically opening the feed water valve when the water level drops to that point. If the furnace is gas, oil or stoker fired, these same controls can be equipped with a low-water cut-off switch that will prevent the admission of fuel when the water-level reaches ¼ in. in the gage. On hand-fired boilers, a warning device takes the place of the cut-off switch.

An investigation of some of our stations may well indicate that it will be economical to convert some of our hand-fired boilers to so-called automatic operation that will not require attention over week-ends. Unless some of these things are done, I anticipate more than the usual amount of trouble during the coming winter, principally from lack of adequate attention being given to heating facilities.

Effect of Uneven Rail-End Surface

What effect does mill tolerance, end batter and other irregularities in rail-end surface have on joint maintenance? Would the maintenance of good line and surface be affected appreciably if such irregularities were **entirely** eliminated? Explain.

Irregularities Means A Lot

By W. M. S. Dunn
General Roadmaster, New York, Chicago & St. Louis, Bellevue, Ohio

This question is one which, in my opinion, fundamentally involves the advantages or disadvantages to be derived from the elimination of rail joint conditions.

Mill tolerance, as allowed in rail specifications, is of minor importance in the installation of new rail in most cases, because the rail ends are usually ground to the right surface before being end hardened.

When rails are laid, it is desirable that the ends fit evenly and firmly in place in regard to alinement and surface. This is attained through the use of a rail joint. No feature of track construction has been of greater concern to maintenance officers than the rail end assembly. This undoubtedly represents the weakest part of the track structure.

To maintain rail properly, it is imperative that care be given from the time new rail is laid until it is replaced. Much of the damage done at rail ends and in joints appears to have its inception in poor work at the time the rail is laid. Aside from the requirements of adequate drainage, good ballast, uniform surface, and adequate tie plates, there have been other important practices developed to prolong the life of rail. It is my opinion that bolts should be retightened within a month after new rail is laid. This assures uniform tension and takes up any loose fit that might result from dislodged mill scale, bolt stretching, and fitting of the bars to the rail. This bolt tightening should be set up as a program from this time forward until the rail is renewed, on a six-month basis, preferably spring and fall.

Rail batter and end overflow is the mashing down of the ends of the rails under impact. This condition undoubtedly is aggravated by improper expansion gaps between the rail ends. These gaps, in turn, are probably caused, at least to a certain degree, by inadequate anchorage.

In recent years the advantage of hardening the ends of new rails to prevent battering and chipped ends has been demonstrated. This consists of hardening the surface of the head of the rail for a distance of three inches from the end. This portion of the rail head is usually given a hardness of approximately 100 Brinell above the other portions of the rail.

Within the last year we have observed, where end hardening has been done, that there is a secondary batter in the rail. This condition can readily be controlled and corrected by the use of modern surface-grinding machines. This method of grinding rail is economical and satisfactory from a maintenance standpoint. In very few cases have we observed rail-end batter where rail ends have been hardened.

In my opinion good maintenance of rail end surface would be appreciably affected if such irregularities were entirely eliminated. However, we know of no way to eliminate the inherent weakness of a joint structure unless the structure itself is eliminated. This, of course, can be attained by the use of continuous welded rail, a development that is receiving intensive consideration from most maintenance officers.

Effect is Obvious

By G. A. Phillips
Chief Engineer, Delaware, Lackawana & Western, Hoboken, N. J.

To me the effect of mill tolerance, end batter and other irregularities in rail-end surface, on joint maintenance is obvious. Mill tolerance gradually creates a joint condition so bad that we grind the rail ends to exactly uniform size at the time we heat-treat our new rail.

We weld rail as often as necessary—sometimes on a six-year cycle and sometimes after a longer interval. Welding increases the life of the rail and reduces the maintenance of joints. Good line and surface generally coincide with good

joint maintenance and we try to be very particular in taking adequate care of our rail by the use of welding and good joint maintenance, including sufficient attention to joint bars and bolts.

Uneven Rail Ends Cause Work

By DRAFTSMAN

Mill tolerance, end batter, and other irregularities in rail-end surface are the primary causes of joint maintenance. In general, overall track maintenance work is directly proportional to the condition of the rail ends.

Battered joints or irregular rail-end surfaces cause greater than normal pounding on the rail ends under traffic. This, in turn, cuts ties and produces low joints. The sway and lurch of cars passing over such joints place a lateral thrust on the track structure because of the tendency of car trucks to slide toward low spots in tangent track. This transfer of thrust alternately from one rail to the other forces track out of alinement and produces bad surface conditions. Uncorrected low joints eventually cause rail to become bent, and in such condition, difficult to hold in good surface.

Much rail is removed from track because of badly worn ends, although it otherwise has several years of serviceable life remaining in it. Welding and grinding rail ends to a smooth surface together with end hardening could have prevented such waste.

The joint area now requires more maintenance than any other part of the track structure. If irregularities in rail ends were completely eliminated, maintenance work on alinement and surface would be greatly reduced, thus effecting longer life for rails and ties as well as lower maintenance costs.

Elimination Effects Savings

By PAUL LOWE
Former Roadmaster

Irregularities on the top of the ball of the rail rupture the track structure in varying degrees, not only in the joint area but throughout the entire rail. Through the elimination of these irregularities, vast savings can be made in track maintenance costs.

One result of reducing surface irregularities would be to reduce the present cost of surfacing and lining track as charged to account No. 220. This could be reduced as much as 80 per cent, and this, plus savings through increased life of materials, would effect an even larger overall savings.

It is the writer's opinion that any and all defects which result in unnecessary vertical force, ranging from the click-click of mill tolerance to heavy impact from joint batter, are progressive multiplying factors, and when prevented from growing, will result in better and safer track at less cost.

Painting Exteriors in Winter

Can the exterior of buildings be painted during the winter? Under what circumstances? What precautions should be taken to assure the best quality of work? Explain.

Impracticable in the North

By B. J. ORNBURN
Engineer & Superintendent, Bridges & Buildings, Chicago, Milwaukee, St. Paul & Pacific, Chicago

It is assumed that this question refers to a general program of exterior building painting and not an isolated job here or there. We have never attempted general repainting of exteriors of buildings during freezing weather and it is my considered opinion that there is no practical way in which this can be done successfully in the Northern territory served by our railroad.

To paint a surface successfully it must, of course, be free of frost and moisture. On certain selected days during the winter months, and for a limited time, conditions may be reasonably favorable to exterior painting. The uncertain occurrence of these intervals would, however, limit such applications to jobs such as priming and painting on new construction work and an occasional individual maintenance job where the crew can turn to other work when weather is not favorable to exterior painting.

Watch Weather, Not Calendar

By MORRIS CAVE
Technical Service Division, National Lead Company, Chicago

This question is answered in our Technical Service Letter entitled, "Four Seasons Are Better Than Two", from which much of the following information is abstracted.

Commercial painters followed, until recent years, a "two season" —from April through June, and Labor Day through early November—policy in painting exteriors of buildings. They didn't start to paint before April and then only with the constant fear that a sudden shower might interrupt their work and that there might follow too few sunny days to dry out the siding before another shower. They stopped painting at the end of June and didn't start again until September largely to avoid the continuous interference of insects.

However, during and since the war, when the urgency of peak construction has demanded year-round painting, the "two-season" policy has been gradually abandoned. Enterprising painters have realized that by watching the thermometer and barometer instead of the calendar, and by adding to available weather reports and predictions some common sense, exterior painting can be done on a year-round basis—within limits.

For winter painting the painter must conform to the dictates of the weather man, and be guided by the hours that the sun shines daily. This means that work should commence no earlier than 9:30-10:00 a.m., in order to allow the sun to dry up the frost and moisture on the siding. The working day should end no later than 4:00 p.m., to allow the paint to set up properly before the sun goes down. Although the painter's working day is shortened by some two hours or more, the concensus is that a six-hour day is just about enough in cold weather.

The paint itself can be mixed at the shop as usual. If, when it is taken to the job site, the paint seems a bit too thick and heavy due to the effect of the low temperature on the linseed oil, simply add a little more turpentine to the paint.

During the winter season, it is always good practice to work with the sun when possible, i.e., to paint the east, south, west and north sides in that order. More time than usual must be allowed to give each coat time to dry and harden thoroughly. At least two weeks should elapse between coats. Before beginning on the second coat, the safest practice—one that is followed by many painters—is to test the apparently dry paint with No. 2/0 sandpaper. If the sandpaper clogs, the surface is not ready for recoating, and should be given extra time for hardening. The paint should be brushed thoroughly, in a rather thin film.

For cold-weather painting, the following rules should be observed: (1) Paint only over surfaces that are thoroughly dry; (2) paint only when there is no dew, fog or frost; (3) paint only when the temperature is above 40 deg. F.; (4) paint only when low humidity and favorable barometer readings forecast good weather, and (5) paint only six hours a day.

Insuring Highest Quality Concrete

During the mixing and placing of concrete on small jobs, who should exercise the vigilance required to insure the highest quality of finished product? What special precautions should be taken?

Concrete Inspector's Job

By M. Hirschthal

Concrete Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

The man to watch small concrete jobs is the concrete inspector, because the foreman is, in general, chiefly interested in "getting the job done", and his attention is directed largely to speed and, unfortunately, only too often to speed alone.

It is the concrete inspector's province not only to watch the mixing and placing, but also to see that the proper materials go into the mixer in correct proportion (which he should inspect before charging to see that it is clean). He should also see that after the concrete is placed in its final position it is subjected to adequate curing for the correct period, depending on the weather and the type of cement that is being used. This makes it necessary for him to know which cement is used.

In inspecting the materials, he must see that there are not too many elongated pieces, chert or other deleterious material in the coarse aggregate, that the fine aggregate is free from loam or clay, that the cement is not lumpy, and that the water is clear. If air-entraining cement is being used he will have to modify the water-cement ratio to take account of the air entrained, allowing one-half to one-third of the air volume as part of the water for the ratio. He should see that the water-cement ratio conforms with the specifications, making an allowance for the moisture in the aggregates, and should make a slump test to check for the proper consistency. He should also check the water gauge on the mixer for accuracy. The time of mix must be watched so that a minimum of one minute mixing is done, and preferably one and one-half minutes. Where air-entraining cement is used, two minute mixing is required and the sand proportion must be corrected.

The placing must be so arranged that the concrete is deposited as directly as possible into the forms in its final position, and the pouring should be continuous until the operation is completed. The concrete should preferably be vibrated by a high-frequency vibrator, otherwise it should be thoroughly rodded after being spread by a hoe and worked around the reinforcement. In doing this work care must be taken not to "over-vibrate". This can be prevented by stopping as soon as moisture or cement paste appears around the vibrator.

Now that the concrete is in place, one of the most important, and the most often overlooked steps in concrete making is necessary, namely curing. This step is absolutely essential to good concrete. The most effective curing agent is water applied as soon as the concrete has set. This should be maintained for various periods of time depending on the type of cement and the weather conditions. Substitutes for wet curing are on the market in the form of surface applications and treated-paper. However, for the first 24 hours, water or wet curing should be used before other curing agents are applied. In warm weather, with normal cement, at least 10, and preferably 14, days of curing is necessary. For type III or high-early strength cement, three days of curing are required. In freezing weather special precautions must be taken, such as heating of aggregates and water, and the maintenance of temperatures above freezing until the concrete has attained its design strength. Any heat applied after pouring must be moist so that the concrete is not dried out.

The general principle in concrete-making is to use as little water as consistent with workability while installing the concrete, and as much water as possible afterwards until the concrete has attained its strength.

Keep Foremen Well-Informed

By J. S. Hancock

Bridge Engineer, Detroit, Toledo & Ironton, Dearborn, Mich.

Since this question is restricted to small jobs, I assume that the foreman in charge of the work would represent the only supervision present. In such case, he would be solely responsible for the field vigilance required to obtain good concrete. However, this man could be held responsible only to the extent that he had been trained and instructed by his superior officers and to the extent of intelligently performing the work in accordance with plans, specifications and instructions furnished him.

If employed by a railroad that has its own research laboratory and materials technicians, or engineering department employees who have the time, qualifications and desire to obtain good concrete, the

concrete foreman on any size job would be fully instructed as to the railroad's standards. Under such conditions all materials delivered to the job and all concrete placed would comply with these standards, and the quality of the resulting concrete would be as satisfactory as our present knowledge of concrete and concrete materials would permit.

For the railroad that does not have the facilities nor the technicians to make a study of concrete, and to develop its own standards, the Masonry committee of the A.R.E.A. has developed a very fine set of instructions entitled, "Proportioning Concrete Mixes for Field Use." This information was developed especially to help the man placing concrete on small jobs, and should be in the hands of every concrete foreman who does not have his own company standards to follow. These data were printed and inserted between pages 320 and 321 of A.R.E.A. Bulletin 477 of December, 1948. The information is condensed to two sides of one sheet, is easy to understand, and contains just the information that the field man needs. Given durable concrete materials, any concrete foreman who is familiar with this A.R.E.A. information should obtain good concrete.

The series of five articles by the late Mr. A. J. Boase on "How to Obtain Better Concrete on the Railroads", published originally by **Railway Engineering and Maintenance,** and now obtainable in pamphlet form from the Portland Cement Association, contains additional detailed information with which every foreman of a concrete gang should be thoroughly familiar.

In my opinion, a concrete foreman on small jobs should not be held responsible for obtaining satisfactory concrete aggregates or cement. These should be obtained and furnished to him only from sources that, from previous experience, have produced materials that have proved to be durable or that have been laboratory tested and found to be satisfactory. Concrete materials meeting the State Highway Specifications of the state in which they are purchased should be satisfactory, as most states are now cognizant of the fact that, to obtain good concrete, the materials used must meet definite requirements as to durability.

Insofar as the central states are concerned, transit-mix concrete is readily available and is extensively used on both small and large jobs. The quality of concrete obtained from this source is largely dependent upon the knowledge and integrity of the supplier. Unless the supplier's aggregates and cement are durable, one will not get durable concrete. Here again, it is necessary to know that the supplier's materials have proved durable over a long period of time, or laboratory tests will be required to determine their durability. Concrete can also be ordered in accordance with State Highway Specifications for the grade of concrete and materials required. In this case, the order should be placed by the engineering employee in charge of the work; or the plans, specifications or instructions furnished the foreman shoud definitely specify the State's grade of concrete required, stating that the aggregates and cement are also to meet the State's specifications, so the foreman can order concrete to be delivered exactly in accordance with the plans, specifications and instructions furnished him.

I shall not attempt to discuss methods of mixing, placing, curing, protecting and many other points that are extremely important. However, the five articles by Mr. Boase, previously mentioned, cover these points in detail and it is suggested that they be studied.

Keeping Passenger Station Marble Clean

What methods are most effective in cleaning marble in station concourses, waiting rooms and washrooms? How can stains be removed? Explain.

Don't Use Strong Soaps

By V. V. Holmberg

Engineer Maintenance of Way, Chicago & Western Indiana, and Belt Railway, Chicago

Polished marble on interior walls of railway passenger stations represents, a large investment by railways. It is installed to give the effect of natural permanence, beauty and long life. Most marble is comparatively soft and delicate and the high degree of polish on its surface must be preserved to retain its charm and beauty. If not cleaned properly, the polished surface may be injured.

Interior marble should be cleaned as soon as there is evidence of a cloudy film of grease, dirt and dust adhering to its surface. Never use ordinary soaps and soap powders customarily used for cleaning painted walls. They often contain acids and harsh impurities. Those responsible for the maintenance of marble walls should be cautioned not to experiment with ordinary detergents because the damage done may be irreparable. Consult any reputable marble company or the Marble Institute of America, Inc.* and they will be more than glad to recommend a recognized satisfactory detergent.

The surface of the marble should be thoroughly dampened with clean water before washing with the cleaning material. This makes rinsing easier and will prevent any injurious action from salts in the cleaning preparation. After rinsing, polished marble should be wiped dry with achamois skin.

The treatment of stains is a problem quite independent from general cleaning, and here again it is recommended that a reputable marble company or the Institute be consulted. The treating of stains is not easy and requires patience and persistence. Stains should be treated as soon as possible after appearing, because the longer they stand the more deep seated they become. The best method for removing stains and discolorations that come from neglect is with a poultice made from a detergent. It is generally applied hot about ¼ in. thick and allowed to remain from 48 to 72 hours. Several applications may be necessary to get satisfactory results. Ink, oil and tobacco require different treatment, and the systematic application of the proper stain remover is usually successful.

* 108 Forest Ave., Mount Vernon, N. Y.

PRODUCTS OF MANUFACTURERS

New, improved equipment, materials, devices

For additional information on any of the products described in these columns, use postcards, page 1039)

NEW COMPOUND PROTECTS CROSSTIES

THE Koppers Company, Pittsburgh, Pa., has announced the development of a new coal-tar sealing compound for application to the top surfaces of crossties and open-deck bridge ties to prolong service life. It is said that results to date of an actual service test of the compound, now in track for two years, indicate that its use will retard natural destruction of ties from such causes as checking, splitting and mechanical mutilation. It is also claimed that application of the product will minimize the danger of fire from hot coals or ashes.

The new tie sealer, known as Compound No. 16, was developed by the Tar Products Division of

Large checks and splits in some of the ties in the test track on the Erie were caulked in advance of the application of Compound 16 to the top surfaces

Koppers, and laboratory and field tests in connection with its railway application were conducted by the company's Wood Preserving Division, Orrville, Ohio. It is a free-flowing liquid which may best be applied to ties in track by spraying with pressure equipment, but it may also be applied by daubing or brushing, or with a squeegee.

Upon application, the compound enters and fills checks and splits already existing in the wood and then spreads over the top surface to form a protective seal, excluding water. By retarding checking and splitting, which ultimately expose the untreated parts of ties to the weather, the compound is also expected to reduce tie failures from interior decay and center rot.

An extensive service test of the new compound was begun in October, 1947, on a half-mile section of main-line single track of the Erie. Examination of the ties in this section, prior to the start of the test, showed that a number were badly weathered, with some fairly large checks and splits. This damage was in part caused by the almost constant stream of water that falls on the ends of the ties from the continuous blow-off cocks on Erie steam locomotives. Freezing of this water in cold weather had caused many of the checks to expand until they were quite large, and in some cases it was noted that the force of this expansion had been sufficiently great to straighten the "S" irons embedded in the tie ends.

On the Erie test, which is being conducted under the direction of Blair Blowers, chief engineer maintenance of way, and R. E. Poux, chief treatment inspector, the unheated sealing compound was applied by spraying. The equipment consisted of a tractor-mounted air compressor, on which a rear-extension platform was built, an Alemite air-operated Versatal pump, and the necessary spray guns and light hose lines. The extension platform on the tractor accommodates a 55-gal. drum of Compound 16, on which the Alemite pump was mounted. The compressor traveled along the roadbed shoulder, keeping pace with the work.

The first step in the application was to fill the large checks and splits with the compound, using the spray guns. It was found that the air pressure in this operation was sufficient to blow dirt and bal-

Track test of Compound 16 on the Erie. The newly-applied material has a glossy appearance which disappears in service. Ties with severe checks or splits were not included in the test and contrast sharply with the coated ties

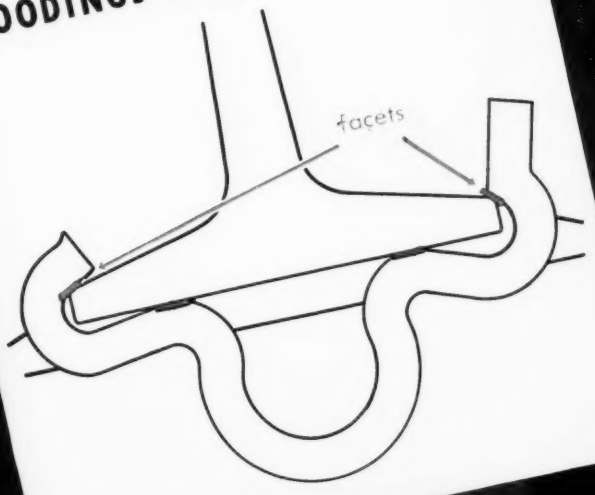
last from the checks. With this filling completed, the material was then spread over the entire top surfaces of the ties, forming a thick coating. A soft brush was used to work the material into the deep checks and splits, and around the tie plates, to assure an effective seal against moisture. During the application process, lightweight shields were placed over the rails.

The crew required for the application consisted of a foreman and five men. These included the compressor operator, a spraver, a flagman and two helpers. The helpers moved the shields and the spray equipment, caulked the larger splits, and performed other incidental work.

When Compound No. 16 is first applied it has a glossy appearance which later disappears. The coated

(Continued on page 1108)

THE ADVANCED TYPE
WOODINGS RAIL ANCHOR



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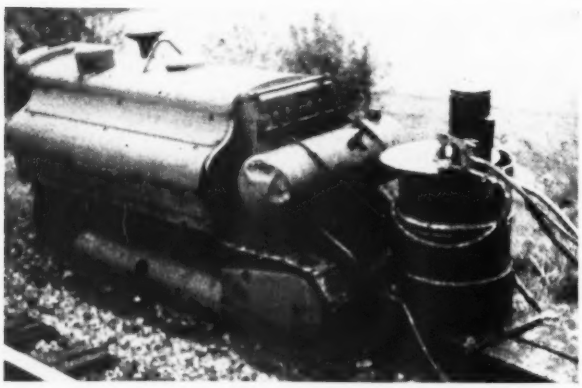
ties have a tendency to be somewhat slippery, and the manufacturer suggests that a small quantity of ¼-in. aggregate be distributed over the top surface to counteract this.

On the Erie test, one gallon of Compound 16 was sufficient to coat 3.65 ties. More would be needed where the ties require a large amount of caulking to fill the checks and splits.



The trailor-mounted compressor used in applying Compound 16 to the Erie test track. The platform at the rear carries a drum of the material and a pump for applying it

ONE-MAN CHAIN SAW

THE McCulloch Motors Corp., Los Angeles, Cal., has announced its Model 3-25 one-man gasoline-powered chain saw, which, weighing only 25 lb., develops a full three horsepower. Other features of the saw include hand grips shaped and positioned to permit easy sawing both left or right-handed in either vertical or horizontal position; a trigger-controlled throttle; a built-in chain oiler controlled by a thumb button just above the throttle; a primer for starting; and a kick-proof re-wind starter. The saw is powered by a McCulloch two-cycle, air-cooled gasoline engine.

Three models of the saw are available: 18-in. and 24-in. straight-blade units; and a 14-in. bow saw. The power unit is the same for all three models, and the straight blade can be easily interchanged with the bow-saw blade.

The McCulloch Model 3-25 chain saw which, weighing only 25 lb., develops a full 3 horsepower

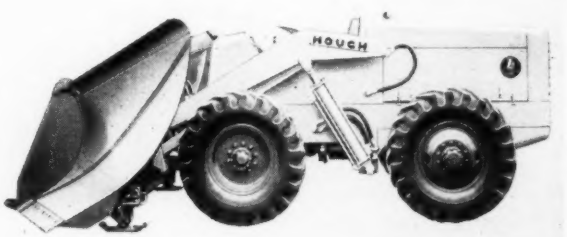
The Impactor is said to produce greater weight and density than is obtained with a 10-ton roller

IMPACTOR IMPROVED

A NUMBER of mechanical improvements, designed to give increased performance, are offered in the latest Model 25-C Wayer Impactor for "super-tamping" dry and bituminous materials and earth at railroad crossings, along sidings and at station parking areas. This unit is manufactured by the Wayer Impactor Sales Co., Columbus, Ohio. Tamping impact has been increased to 1,250 ft.-lb. delivered at a speed of 1,900 blows per minute. New self-priming, constant speed carburetor, flexible break-proof gas line, heavy-duty fuel tank, anchored bolts and screws, long-life shock absorbers and more efficient heating of the tamping-finishing plate are now provided.

The machine is self-propelled and is claimed to be capable of tamping and smoothly finishing 60 to 80 sq. ft. per. min. By power impaction it is said to produce greater weight and density in patch materials than is obtained with a 10-ton roller and can also work flush against rails, curbs, manholes,

(*Continued on page 1110*)

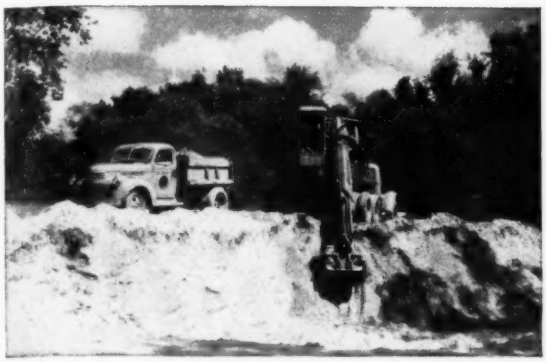


A Hough Model HM Payloader with snow-plow attachment

SNOW PLOW ADDED TO HOUGH PAYLOADER

THE Frank G. Hough Company, Libertyville, Ill., has announced that a snow-plow attachment is now available for the Hough Model HM Payloader—a 1½-cu. yd., 75-hp. earth-moving and materials-handling machine with four-wheel drive and large pneumatic tires. Offered in either a "V" type or a reversible-blade type, as desired, the snow-plow is designed to interchange readily with the bucket of the machine, and is raised and lowered by hydraulic control.

Action Snapshots from Coast to Coast tell the GRADALL story!



A State Highway Department in one of the large Southern States has three machines. One of their many jobs is to load out bank run sand for use on a new highway project.

The Department of Public Works of one of the largest northeastern States is cleaning drain ditches overgrown with vegetation.

A large San Francisco contractor removing track, 4" pavement, 8" concrete, and ties. Close work around catch basins, manholes, track frogs, etc., eliminated much hand labor.

At Oak Ridge, Tennessee, one of the country's largest contractors is digging a trench prior to laying drain pipe. The Gradall will lift the pipe into the trench, and backfill without hand labor.

A big utility company in the South owns two Gradalls. One is here placing drain pipe under existing culvert, working in extremely cramped quarters.

A Midwest contractor working on a track removal job. Bricks, concrete base, and rails all removed by the Gradall, with a minimum of hand labor.

For every kind of earth-moving job, digging and cleaning ditches, removing rails, excavating, laying drainage tile and water mains, Gradall fills the bill. It's fast, accurate, dependable—enables the contractor or maintenance crew to do *more* jobs, *faster*, and at *lowest* cost. Be sure to see a Gradall in operation before you buy.

Gradall Reg. U. S. Pat. Off.

GRADALL DIVISION
WARNER & SWASEY
Cleveland

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE

For additional information on any of the products described on this page, use postcards, page 1039.

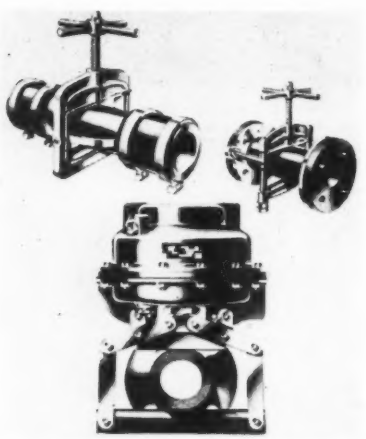
and walls. It is said to work between tracks and rails, without damage to signal system wiring. Paving, railroad crossing and siding maintenance, laying driveways and parking lots, and tamping ditches and other large earth areas are its principal applications.

Its compact size, and overall weight of 240 lb., permit the Impactor to be carried in light trucks; also it can be easily and quickly moved aside for passing trains.

FLEXIBLE VALVE

THE Flexible Valve Corporation, Palisades Park, N. J., is introducing into the railway field its flexible valve, a unit that is reported as being well-suited for controlling the flow of abrasive materials. One application for which this device is recommended is at locomotive sanding stations.

Known as the Flex-Valve, this device consists of a flexible tube and a means of pinching the tube



Flex-Valves are available as hand-operated slip-on and flanged types (top), and in an automatic model (bottom), powered by a diaphragm motor

to shut off the flow. The tube embodies a liner of pure gum rubber, covered with bias-woven cloth impregnated with rubber. After being given a protective cover, the entire unit is molded into a permanent flexible tube. Advantages claimed for this valve include long service life, full pipe capacity, resistance to freezing, and high resistance to corrosion.

Hand-operated valves are offered in sizes ranging from ½ in. to 12 in. A slip-on type, attached to pipe by means of clamps, is available in popular pipe sizes up to 2½ in. A flanged type is available throughout the full range of pipe sizes. In addition, a line of automatic valves, operated by a diaphragm motor, is available in 1-in. to 10-in. sizes.

IMPROVED TRACK JACK

THE Duff-Norton Manufacturing Company, Pittsburgh, Pa., has announced an improved design of its Model 117-A track jack—a 15-ton capacity unit with an aluminum housing. Redesign of this model is reported to afford greater saving in weight and to result in

The improved Duff-Norton Model 117-A track jack features an aluminum frame, bale-type handle and improved operator protection

easier spotting and improved safety of operation.

The new jack features a bale-type handle to facilitate quick and easy spotting. Another feature is a new thumb guard to protect workmen while setting pawls for tripping. Greater strength in lifting and holding loads is said to be possible through the use of a 1⅝-in. square rack.

Other features of the Model 117-A include high-carbon, heat-treated alloy steel pawls, grease-packed and heat-treated bushings, and a hardened steel plate to protect the housing. All parts are interchangeable with those of the Model 117 jack.

DIESEL SAND NOZZLE BY FAIRBANKS, MORSE

FAIRBANKS, Morse & Co., Chicago, has announced a new nozzle for delivering sand to Diesel locomotives. Constructed of steel tub-

The Fairbanks, Morse sand nozzle in the open (left) and closed positions

ing, the nozzle is light in weight, and is said to be weatherproof and leakproof. It has no projecting parts or handles to interfere with easy handling in any position.

An important feature of the nozzle is its simple mechanical construction. The valve is opened merely by pressing a ring against the sandbox opening. It closes quickly and completely by gravity when held in a downward position. Thus, when sanding a locomotive, little or no sand is wasted.

The nozzle is available in three different diameters: 2 in., 2½ in. and 3 in. It is 12 in. long and weighs about 7½ lb.

SYNTRON ROTATING ELECTRIC HAMMER

THE Syntron Company, Homer City, Pa., has announced an electric hammer, known as the Model 25-RO, which both hammers and

(Continued on page 1112)

Moss Crossings ...are black gum and they're tough!

Moss crossings are pressure-creosoted black gum, and they're tough as they come. They will take the hardest kind of pounding from vehicular traffic, and still stand up in good shape with a minimum of maintenance. There is a very good reason for this, and the reason is the black gum from which they are manufactured. Black gum is a hardwood timber growing in the swamps of our southern states, and is well known for its resistance to shock and abrasion. Its the interlocking grain characteristic of this species which gives you that "extra" in resistance to wear and which results in a tough, long lasting crossing that becomes smoother as the years go by.

CROSS TIES
SWITCH TIES
POLES & POSTS
PILING
CROSSINGS

T. J. MOSS TIE COMPANY

The Stamp of Character MTC

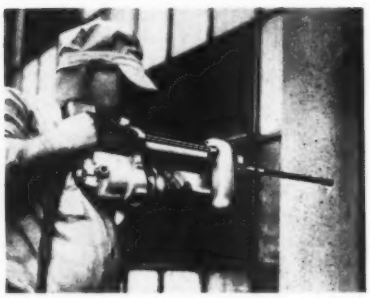
700 SECURITY BUILDING — ST. LOUIS, MISSOURI

WOOD PRESERVING PLANTS

MT. VERNON, ILL.
EAST ST. LOUIS, ILL.
GRANVILLE, MISS.
SHREVEPORT, LA.
COLUMBUS, MISS.

For additional information on any of the products described on this page, use postcards, page 1039)

rotates the drill bit at the same time, thus eliminating the need of quarter turning the star drill wrench by hand to get a round



The Syntron Model 25-RO rotating electric hammer which both hammers and rotates the drill bit at the same time.

hole in concrete, masonry or rock.

The hammer is of an electric-magnetic design with a free-striking piston, and will drill holes up to 2 in. in diameter. It has an automatic safety clutch on the rotating arm that will slip if the bit binds or gets stuck in the hole. Also, the percussive hammering can be stopped while the bit continues to rotate to clean the hole. The hammer weighs 38½ lb. and is available for operation on either alternating or direct current, as desired.

The Syntron Company has also developed a new line of drill steels to use with the new hammer. These drills have carbide cutting edges and spiral flutes that clean the cuttings from the hole as the electric hammer rotates the drill steel.

New Books

ESTIMATING COSTS OF SHOVELS AND CRANES

OPERATING Cost Guide—Technical Bulletin No. 2, 24 pages. Published by the Power Crane & Shovel Association, New York. Price 50 cents.

THIS bulletin, prepared by the members of the Power Crane & Shovel Association, presents a method of estimating costs of ownership and operation of power shovels, hoes, draglines, clamshells and cranes ranging in capacity from ⅜ cu. yd. to 2½ cu. yd., or from 2½ tons to 50 tons. Taking up in order fixed costs, operating costs and other costs, the bulletin analyses each of these items, explaining in detail the data and calculations required to evaluate them in their true perspective.

Since much of the information given is average or theoretical, it is not intended that this bulletin should present an exact method of accounting, nor that the information given will actually be used to estimate or figure a job without substantiating it from experience or other sources. Rather, it is designed as a guide to new owners and students of power cranes and shovels, so that they may more fully appreciate the expenses that experience has shown must be covered if profitable operations are to result.

HOW TO USE YOUR OXYACETYLENE OUTFIT

WELDING and Cutting Manual. 208 pages, illustrations. Published by the Linde Air Products Company, a unit of Union Carbide and Carbon Corp., New York. Price $1.80.

THIS handbook on the oxyacetylene process, written in a simple, readable style and well illustrated, is intended as a reference and instruction book for those concerned with oxyacetylene welding and cutting, and presents hints and short-cuts which will help them do a better job. It contains chapters on bronze-welding; fusion welding; soldering; hard facing; cutting steel and cast iron; heating, forming, and straightening metals; welding and cutting pipe; and welding non-ferrous metals, including aluminum, copper and lead.

In addition the book contains a chapter giving detailed instructions for making more than 100 time and labor-saving devices, such as machinery guards, trailers, shop stools, benches and tools. Useful charts and tables, a complete glossary of welding terms, and a list of 100 repair jobs with recommended welding methods are given in the appendix. The book includes a complete index.

NEW FACTORY TO FEATURE ASSEMBLY-LINE EFFICIENCY—Presented here is an aerial view of the Chicago Pneumatic Tool Company's new $5,000,000 plant at Utica, N. Y., now nearing completion. The main building, more than 1,000 ft. long by 500 ft. wide, was built around two horseshoe-shaped production lines, one for the manufacture of rotary-action tools, and the other for reciprocal-action tools. The resulting layout permitted adoption of a "similar-process" system of flow control that is said to rival automobile assembly lines in efficiency.

Are any of the newer type weed killers

2,4-D — 2,5-D PENTACHLOROPHENOL-TRICHLOROACETATE

the answer to the all around effective weed killer required by railroads?

The world seems suddenly to have become aware of the urgency of the weed control problem. Within the past five years first one, then another new type of weed killer have been given wide publicity and encouraged the conclusion that here at last is the answer to the weed control problem.

The fact is that all of these weed killers are highly selective—meaning, of course, good for the killing of one or more particular varieties of plant growth.

Recently meetings have been held to have men experienced in the use of these new weed killers compare notes on how and where they had proved effective. One of our men recently attended for the first time.

Finding one new face in the group, our representative was invited by a wit in the group to join up with B A I C. The new visitor signified his desire to join up but inquired—what did B A I C stand for? "BOY AM I CONFUSED".

This wit had a point, for in studying the merits of a wide assortment of so-called improved types of weed killers, it takes something of an expert to determine how to use them to best advantage.

We have chemists and experienced maintenance men who work, eat and sleep with weed killers for railroads—365 days a year.

Picture a chemist arriving in California, another one in Florida, in September, nothing to do all fall and winter but try and find better ways and means of killing weeds. Not a dime will they bring in to their company for the next seven months except in some contribution to the improved art of weed control for railroads.

In their kits, brought from headquarters, they have a generous supply of a wide assortment of raw materials, including all of the raw materials mentioned above. And they go to work with one and all of them. Field work supplements laboratory work. Plots are staked, results observed for short and long periods after vegetation has been treated with them in various combinations, dilutions, etc. Raw materials that are a complement to one another in killing different varieties, are utilized in working out chemical combinations and formulations. It requires a chemist of much skill to do this because some materials are water soluble others soluble only in oil, benzol, or some other solvent. To combine into one water soluble, final product is in a nice piece of chemistry. Separation of the ingredients of the product must be prevented by well balanced formulation.

Other considerations are the lure of the raw material for live stock, the element of risk as related to fire or the extent of punishment to men applying, for some chemicals will tear the hide off a rattlesnake and men will not tolerate such punishment.

The know-how of combining the desirable properties of numerous raw materials, may permit of combining them into one product that is effective and safe to use as an all around weed killer—which is the type of weed killer that a railroad must have.

IS THIS A TASK FOR A SPECIALIST? WE KNOW THAT IT IS AND THAT'S OUR BUSINESS. IT HAS BEEN OUR BUSINESS FOR OVER SIXTY YEARS. PERHAPS WE CAN ASSIST YOU IN YOUR WEED CONTROL PLANS.

READE MANUFACTURING CO., Inc.

Executive Headquarters
135 Hoboken Avenue
Jersey City, N. J.

Service Headquarters
9500 Cottage Grove Avenue
Chicago, Illinois

PLANTS AT NUMEROUS RAILROAD CENTERS

THE MONTH'S NEWS

Happenings among the railways — the associations — the suppliers

Changes in Railway Personnel

General

W. T. Elmes, assistant chief engineer of the Pittsburgh & Lake Erie and the Lake Erie & Eastern, has been promoted to superintendent of those roads, with headquarters as before at Pittsburgh, Pa.

A. L. Fisher, assistant superintendent and division engineer of the St. Louis-San Francisco, at Enid, Okla., has been appointed assistant superintendent-division engineer, Western division, with the same headquarters.

Orlando H. Frick, formerly a district engineer on the Chicago, Milwaukee, St. Paul & Pacific, whose retirement as general manager of the Chicago Union Station was reported in the October issue, was born at Manitowoc, Wis., on September 25, 1879. He graduated from the University of Wisconsin in 1902, and started his railroad career the same year with the Louisville & Nashville as a levelman on a construction crew. After serving as assistant engineer on the Chicago, Rock Island & Pacific, he became resident engineer of the Missouri, Oklahoma & Gulf (now Kansas, Oklahoma & Gulf) at Muskogee, Okla., in 1904. Later the same year he was appointed a resident engineer in Florida for the Apalachicola Northern. He subsequently joined the Chicago, Milwaukee, St. Paul & Pacific, and served successively as assistant engineer, pilot engineer and field engineer on valuation, until his promotion to district engineer of the middle district at Milwaukee, Wis., in 1919. Mr. Frick was advanced to superintendent of the Milwaukee's La Crosse division at Portage, Wis., in 1922, and became general manager of the Chicago Union Station in 1931.

Engineering

Frederick L. Galloway, transitman on the Syracuse division of the New York Central, has been appointed assistant engineer, with headquarters as before at Syracuse, N. Y., effective October 1. He succeeds **S. P. Anderson,** who has retired.

Milton C. Blanchard, chief engineer of the Coast Lines of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Cal., has retired, effective October 31, after more than 44 years of service with the Santa Fe. Mr.

Milton C. Blanchard

Blanchard was born at Hamlin, Kan., on October 17, 1879, and attended Hiawatha academy and the University of Kansas, receiving his B.S. degree in civil engineering in 1902. He entered the service of the Santa Fe as a rodman, subsequently serving as a topographer and transitman until 1905, at which time he was appointed assistant engineer. In 1907 he was advanced to division engineer, and in 1909 he was appointed roadmaster and assistant engineer, returning to the position of division engineer in 1911. Mr. Blanchard was appointed office engineer for the chief engineer in 1913, and subsequently served as district engineer ond division superintendent until 1922 when he was promoted to chief engineer of the Western Lines and of the Panhandle & Santa Fe (a subsidiary of the Santa Fe), with headquarters at Amarillo, Tex. In 1929 Mr. Blanchard was appointed chief engineer of the Coast Lines, the position he held at the time of his retirement.

E. W. Niblet, assistant engineer on the Chesapeake & Ohio, has been appointed assistant engineer buildings, with headquarters at Richmond, Va. **L. A. Olson,** designing engineer bridges, has been advanced to assistant engineer of the Pere Marquette district, with headquarters at Detroit, Mich.

A. M. Weston, chief draftsman on the Baltimore & Ohio, has been promoted to senior assistant engineer, with headquarters at Baltimore, Md.

Robert M. Brown, division engineer of the Union Pacific at Salt Lake City, Utah, has been appointed resident, engineer, with headquarters at Hermiston, Ore.

L. S. Bottinelli has been appointed assistant engineer of the New York Central system, with headquarters at New York.

D. A. Webster, levelman on the Delaware & Hudson at Davenport Center, N. Y., has been promoted to assistant engineer, with headquarters at Albany, N. Y.

J. L. Looney, division engineer of the Schreiber division of the Canadian Pacific, has been transferred to the Smith's Falls division, with headquarters at Smith's Falls, Ont.

John C. Neff, assistant supervisor of track on the Eastern division of the New York Central at Beacon, N. Y., has been advanced to assistant engineer in the office of the engineer maintenance of way, with headquarters at New York.

M. D. Thompson, special engineer in the office of vice-president and chief engineer of the Illinois Central at Chicago, and formerly assistant bridge engineer on the Chicago Great Western, retired on July 30.

E. L. McDonald, division engineer on the Atchison, Topeka & Santa Fe, with headquarters at Needles, Cal, has been transferred to San Bernardino, Cal., replacing **L. E. Smith,** who has been appointed assistant division engineer at Fresno, Cal., to succeed **W. L. Seabridge.** These changes were brought about due to a consolidation of territories.

George A. McRoberts, bridge and building supervisor on the Southern at Lexington, Ky., has been promoted to assistant division engineer, with headquarters at Louisville, Ky.

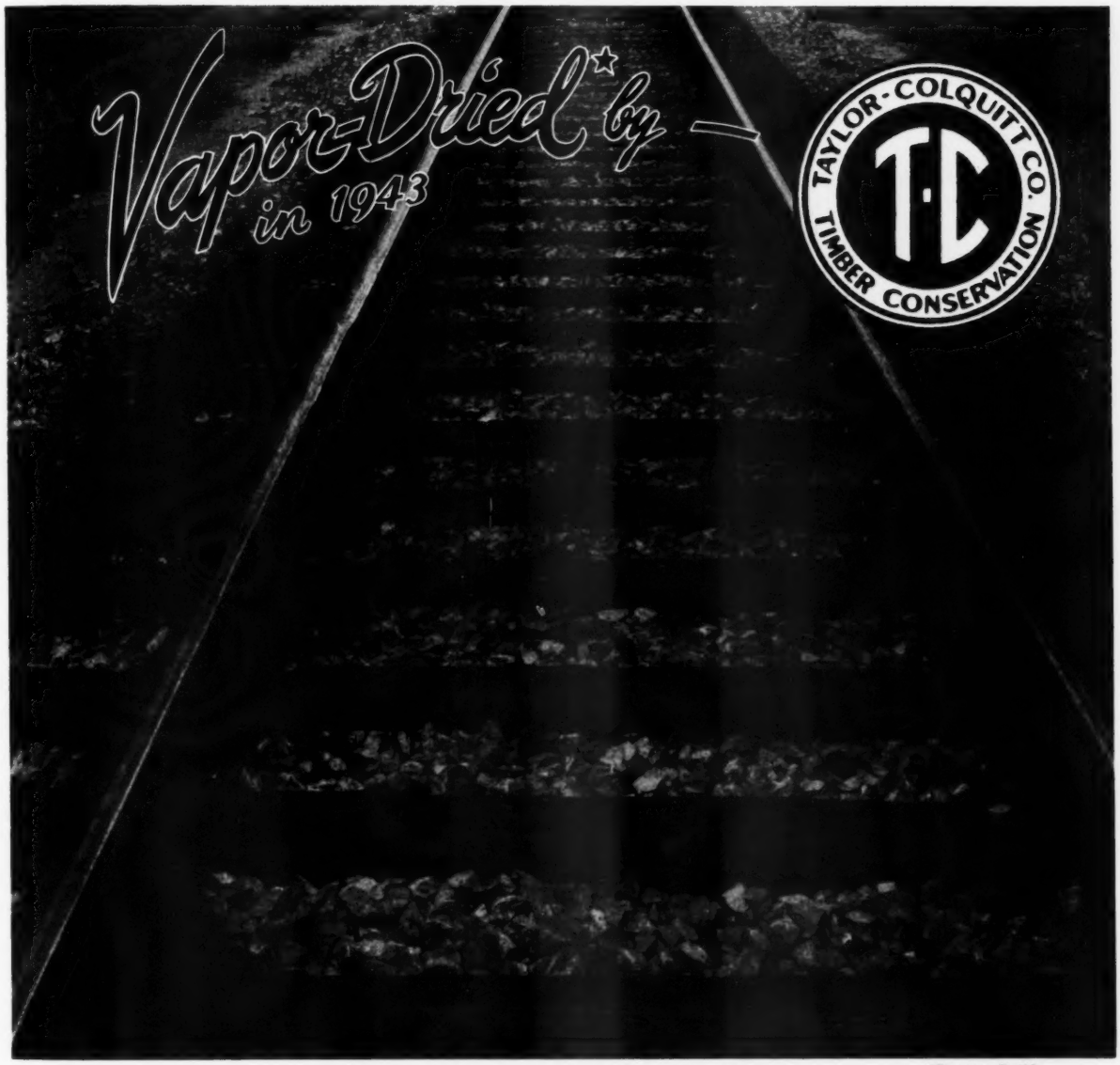
(Please turn to page 1116)

6 Years Old

Do Your Ties Look Like These?

This should justify your confidence

Economize NOW!



Unretouched photo of Red Oak Ties after 6 years service—Note absence of checks and splits

*Process Pat'd

TAYLOR-COLQUITT CO., SPARTANBURG, S. C.

Railway Personnel (Cont'd)

F. E. Austerman, acting assistant chief engineer of the Chicago Union Station Company has been advanced to assistant chief engineer, with headquarters as before at Chicago.

The Pennsylvania has abolished the positions of general superintendent of the Northwestern and Southwestern divisions, and their accompanying organizations, and the following engineering staff changes have been announced in this connection, effective October 1. **M. C. Bitner,** engineer maintenance of way of the Northwestern division, has been appointed assistant to the chief engineer maintenance of way, Western region, with headquarters as before at Chicago. **W. W. Boyer,** engineer maintenance of way of the Southwestern division, Indianapolis, Ind., has been transferred to the Northern division at Buffalo, N. Y., replacing **C. R. Montgomery,** who has been appointed division engineer of the Philadelphia division at Harrisburg, Pa. **K. A. Werden,** formerly division engineer of the Philadelphia division, has been transferred to the Williamsport division at Williamsport, Pa. succeeding **S. M. Rodgers,** who has been appointed assistant engineer in the office of the chief engineer maintenance of way of the Eastern region, Philadelphia, Pa. This road has also abolished the division organization of the Grand Rapids division, which now forms a part of the Fort Wayne division. **W. C. Gretzinger,** division engineer of the Grand Rapids division, has been appointed division engineer of the Fort Wayne division, with headquarters remaining at Grand Rapids, Mich.

J. P. Ensign, engineer maintenance of way of the Pittsburgh & Lake Erie and the Lake Erie & Eastern, has been promoted to assistant chief engineer, with headquarters as before at Pittsburgh, Pa., succeeding **W. T. Elmes,** whose appointment as superintendent is announced elsewhere in these columns. **R. E. Vandivort,** roadmaster, succeeds Mr. Ensign as engineer maintenance of way.

J. E. Spangler, student engineer on the Georgia division of the Seaboard Air Line, with headquarters at Howells, Ga., has been promoted to assistant to division engineer at the same location.

Track

George E. Tressler has been appointed track supervisor on the Eastern division of the Atchison, Topeka & Santa Fe, with headquarters at Emporia, Kan.

Ivan Spees, assistant roadmaster on the New York, Chicago & St. Louis at East Cleveland, Ohio, has been promoted to roadmaster on the Lake Erie and Western district, with headquarters at Tipton, Ind., succeeding **G. C. McCorkle,** who retired on September 16, after 36 years' service, because of ill health.

H. J. Lieser, track supervisor on the Chicago & Western Indiana, with headquarters at Chicago, has been appointed assistant roadmaster with the same headquarters. **Joe Andrewsh,** extra gang foreman, has been advanced to track supervisor with headquarters as before at Chicago.

L. E. Brault, assistant supervisor of track on the St. Louis division of the Illinois Central, has been promoted to supervisor of track, with headquarters at Centralia, Ill., to succeed **J. H. Megee,** who has been transferred to the East St. Louis Terminal division. Mr. Megee replaces **C. E. Weller** who has been assigned to other duties. These changes were effective October 1.

D. L. Cutler, roadmaster on the Chicago Milw., St. Paul & Pacific, with headquarters at Beloit, Wis., has been transferred to Horicon, Wis., succeeding **L. W. Cole,** who in turn has been transferred to Milwaukee, Wis. **R. G. Scott,** roadmaster at Milwaukee, has been transferred to the Chicago Terminal, succeeding **W. A. Walker,** who has been transferred to Madison, S. D., to succeed **N. Martinson,** who has been assigned to other duties. These changes were effective October 1.

(*Please turn to page 1118*)

CLEAN BALLAST at LOWEST COST

When stone ballast is cleaned by the Speno method, which consists of two complete cuts over the same territory, it has a lasting effect, and it is accomplished in less time than a single cut with other mechanical methods.

Preferably, the ballast is cleaned ahead of a general track raise, and under the Speno method, no cribbing is necessary. Because of the drainage that the Speno method attains, the cleaning lasts from one general raise until it is time for another general raise, normally over a period of from three to six years, depending on conditions.

Experience gained over a period of twenty years in cleaning railroad stone ballast, proves conclusively that the Speno method provides a self-cribbing track. By eliminating the necessity of cribbing track, a big saving accrues to the Railroad Company.

Last year the Speno machines cleaned a total of 1785 track miles, which by reason of the two cuts made, is the equivalent of 3570 track miles of single-pass cleaning under customary ballast cleaning methods. This was accomplished in 3646 hours 22 minutes of actual working time.

Railroad Companies can't afford not to investigate the Speno method of ballast cleaning.

FRANK SPENO RAILROAD
BALLAST CLEANING CO. INC.
628 West State Street Ithaca, N. Y.

Since the publication of this article OVER 10 thousand copies of this pamphlet have been distributed to more than 70 railroads.

Insulated Rail Joints

THEIR INSTALLATION AND MAINTENANCE

By E. F. SCHERMERHORN
Manager, Insulated Joint Department,
The Rail Joint Company, Inc., New York

Reprinted from RAILWAY ENGINEERING AND MAINTENANCE, December 1947, and RAILWAY SIGNALING, January 1948.

COPIES WILL BE SENT ON REQUEST

THE RAIL JOINT COMPANY, Inc. 50 CHURCH ST., NEW YORK 7, N. Y.

Railway Personnel (Cont'd)

N. O. Erlandson, roadmaster on the Canadian Pacific at Reston, Man., recently retired after 46 years of service.

John K. Yohe, supervisor of track on the Pittsburgh & Lake Erie at McKeesport, Pa., has been promoted to roadmaster, with headquarters at Pittsburgh, Pa., succeeding **R. E. Vandivort,** whose promotion to engineer maintenance of way is announced elsewhere in these columns. **James M. Dobbs,** assistant supervisor at East Youngstown, Ohio, has has been advanced to supervisor at McKeesport, replacing Mr. Yohe.

Robert J. Klueh, assistant supervisor of track on the Electric division of the New York Central, at Harmon, N. Y., has been promoted to supervisor of track of Subdivision 25, Pennsylvania division, with headquarters at Wellsboro Junction, Pa., where he succeeded **C. W. Campmen,** who died recently. **Harvey E. Newcomb,** track foreman on the Buffalo division, has been promoted to assistant supervisor on Subdivision 2, Electric division, at Harmon, to replace Mr. Klueh. **Andrew Bell,** assistant engineer in the office of the engineer maintenance of way, New York, has been appointed assistant supervisor of track on Subdivision 8, Mohawk division, with headquarters at Oneida, N. Y., succeeding **William Baerthlein,** who has been transferred to Subdivision 13, Buffalo division, at Buffalo, N. Y., to replace **W. M. Jackson,** who has been assigned to duties in the operating department. **Thomas Burrell,** Jr., transitman on the Eastern division, has been promoted to assistant supervisor on Subdivision 29, Eastern division, at Brewster, N. Y., succeeding **S. D. Van Akin,** who has been transferred to Subdivision 3, Eastern division, Beacon, N. Y., to replace **John C. Neff,** whose promotion to assistant engineer is noted elsewhere in these columns.

Water Service

B. W. DeGeer, engineer of water service of the Great Northern, has been appointed engineer of water service and fuel facilities, with headquarters as before at St. Paul, Minn.

Special

D. L. Murray recently appointed manager of treating plants, system, of the Atkinson, Topeka & Santa Fe, with headquarters at Topeka, Kan., as announced in the October issue, was born at Caldwell, Tex., on May 30, 1885. He entered railroad service on May 28, 1910, with the Santa Fe as a gang foreman for the Santa Fe Tie & Lumber Preserving Co., at Somerville, Tex., and on April 1, 1915, he was advanced to general foreman. He

D. L. Murray

was appointed inspector for the manager of treating plants at Topeka on January 20, 1920. In April of that same year Mr. Murray was advanced to superintendent of the treating plant at Albuquerque, N. M., and on July 1, 1923, was transferred to National City, Cal. On December 1, 1944, he was appointed assistant manager treating plants, system, at Topeka, the position he held at the time of his recent promotion.

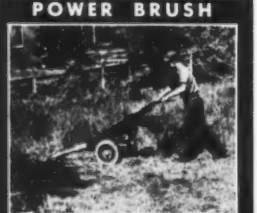
James S. Giddings, whose appointment as assistant manager of treating plants of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., was announced in the October issue, was born at Lyons, Tex., on March 26, 1901. He received a Bachelor of Arts degree from Southwestern University in 1922, and entered railroad service with the Santa Fe on June 7, 1923, as stationary foreman for the Santa Fe Tie & Lumber Preserving Co., Somerville, Tex., later being appointed treating inspector for the manager of treating plants at Topeka. On May 1, 1924, he was advanced to chemist for the treating plant at National City, Cal., and in April, 1925, he was transferred to the Santa Fe Tie & Lumber Preserving Co. Mr. Giddings was appointed inspector for the manager of treating plants at Topeka on February 16, 1938, and was advanced to superin-

James S. Giddings

Cut the cost of RIGHT-OF-WAY and STATION MAINTENANCE with GRAVELY *POWER* EQUIPMENT!

48" SNOWPLOW

POWER BRUSH



MOWER

SNOW REMOVAL . . . Clear docks, platforms and drives quickly with the 48" Snow Plow Attachment for the powerful 5-HP GRAVELY. One Snow Plow does the work of eight men—proved in user tests.

POWER SWEEPING . . . Keep stations, walks and drives shining with the Rotary Brush Attachment. 38" of sweeping width, replaceable brush segments, gear driven. Sweeps CLEAN the first time over.

MOWING . . . Mow right-of-ways and lawns economically with the GRAVELY mowing attachments. Rotary Mower for station lawns, Sicklemower for right-of-ways. Extension axles allow efficient work on 60 degree slopes.

SAVINGS in maintenance cost are an old story to GRAVELY users. Ask us for details about our 17 attachments. SERVICE is always available, anywhere, for the GRAVELY . . . and the GRAVELY has a REVERSE, DIRECT GEAR DRIVE, 5 HP.

GRAVELY
MOTOR PLOW & CULT. CO.
Box 1142
DUNBAR, W. VA.

SEND FOR NEW FREE CATALOG

tendent of treating plants at National City on December 1, 1944. He was transferred to Somerville on July 1, 1946.

Bridge and Building

Milton P. Oviatt, bridge and building supervisor on the Southern at Hattiesburg, Miss., has been transferred to Lexington, Ky., where he succeeds **George A. McRoberts** whose promotion to assistant division engineer is noted elsewhere in these columns.

William A. Burns, Jr., bridge and building inspector on the Electric division of the New York Central at New York, has been appointed assistant supervisor of bridges and buildings of the Pennsylvania division, with headquarters at Clearfield, Pa., effective October 1, He succeeds **Burton Rowles,** who has retired.

Obituary

R. H. Emerson, retired right-of-way engineer of the Canadian National, died recently at Moncton, N. B., at the age of 69.

Henri J. Gagnon, roadmaster on the Canadian Pacific at Sherbrooke, Que., died recently at the age of 45.

Joseph R. Manley, architectual designer on the New York Central at New York died recently at the age of 48.

Frank Topham, retired roadmaster on the Canadian Pacific, died recently at Mission, B. C.

C. W. Campman, supervisor of track on Subdivision 25, Pennsylvania division of the New York Central, at Wellsboro Junction, Pa., died on September 23.

William C. Jones, who died on September 12 while serving as assistant to executive vice-president of the Denver & Rio Grande Western, and who was formerly chief engineer of the Denver & Salt Lake, as reported in the October issue was born at Fredericksburg, Va., on December 14, 1885, and received his higher education at Fredericksburg College and Virginia Polytechnic Institute. He began his railroad career in 1905 as a chainman on the Richmond, Fredericksburg & Potomac, and joined the Carolina, Clinchfield & Ohio in the following year, serving successively as instrumentman, inspector and draftsman at Johnson City, Tenn. Mr. Jones later served in engineering posts with several concerns and with the Seaboard Air Line, the Winston-Salem Southbound and the Chesapeake & Ohio. He became associated with the Denver & Salt Lake in 1927 as assistant engineer at Denver, advancing to chief engineer in 1930. He was out of the railroad industry from May, 1942, until May, 1943, then joining the Rio Grande as assistant to general manager.

(*Please turn to page 1120*)

"At this point my thoughts always turn to slip-resistant 4-WAY Safety Plate!"
Men and women are always more confident—and do better work—with Inland 4-WAY Safety Plate underfoot. For 4-WAY's raised-lug pattern gives them sure footing . . . *always*. It is easy to install on floors, ramps, steps . . . and, made of steel, will last for years. INLAND STEEL CO., 38 South Dearborn Street, Chicago 3, Ill.
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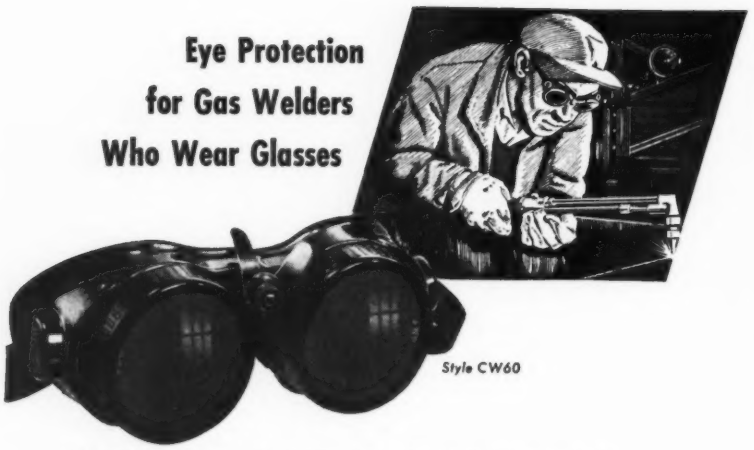
Inland
4-WAY
SAFETY PLATE
STOCKED BY LEADING STEEL WAREHOUSES
Reg. U. S. Pat. Off.

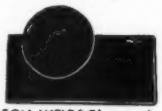
Eye Protection for Gas Welders Who Wear Glasses



Style CW60

There's comfort for wearers of prescription glasses in WILLSON Cover-All* welding goggles with the deep eye cups. And the adjustable leather bridge covers a danger spot and rests lightly on the nose. WILLSON-Weld* lenses are carefully matched for pairs; inspected for finest optical quality, and exceed Federal Specifications for filtering out ultraviolet and infrared rays.

Style DC53 Chip-Weld Goggles



WILLSON-WELD* Glass made in shades from 3 to 14 incl. for all kinds of gas and arc welding.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest WILLSON distributor or write us direct.

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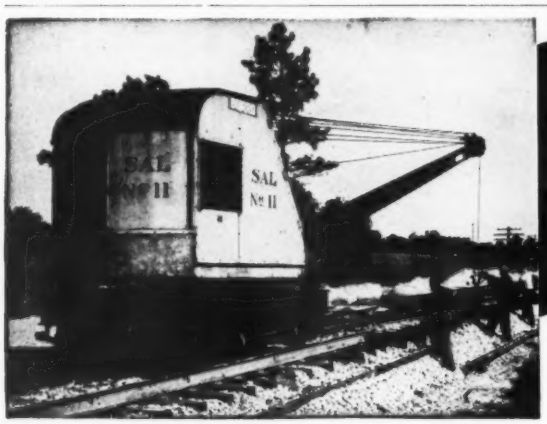
WILLSON PRODUCTS, INC., 243 WASHINGTON STREET, READING, PA.



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Only

Burro Cranes Have:

- Fast travel speeds—up to 22 M.P.H.
- Draw Bar Pull of 7500 lbs. (often eliminates need for work train or locomotive).
- Elevated Boom Heels for working over high sided gondolas.
- Short tail swing—will not foul adjoining track.
- Low overall height—Burro can be loaded and worked on a standard flat car.

We call Burro Cranes "Railroad Specialists" because they do so many railroad jobs so well. Track work, bridge work, bulk materials handling, Mechanical Stores Department, material handling with or without magnet, are only a few jobs Burro does with speed and economy.

Burro Cranes are designed for railroad work—not adapted to it. Watch a Burro work and see why it's called on to do so many jobs by most of the country's railroads.

Burro WORK Power means more EARNING Power

CULLEN-FRIESTEDT CO.
1301 S. Kilbourn Ave., Chicago 23, Ill.

Association News

Roadmasters' Association

Duplex cards have gone out to all members urging their participation in committee work during the current year and asking their preference in assignment to specific committees. It has been asked that these cards be returned to the secretary by November 20, looking to the final selection of the committee personnel, on the basis of the expressed preferences of members, at a meeting of the Executive committee to be held early in December.

Bridge and Building Association

Looking to the appointment of committee personnel for the various technical committees for the current year, which appointment will be made at a meeting of the Executive committee in December, the secretary of the association has sent to all members a duplex postcard, asking

Meetings and Conventions

American Railway Bridge and Building Association—Annual meeting, September 18-20, 1950, Hotel Stevens, Chicago. Elise LaChance, Secretary, 431 S. Dearborn Street, Chicago 5.

American Railway Engineering Association—Annual Meeting, March 14-16, 1950, Chicago. W. S. Lacher, Secretary, 59 E. Van Buren street, Chicago 5.

American Wood-Preservers' Association—Annual meeting April 25-27, 1950, Rice Hotel, Houston, Tex. H. L. Dawson, Secretary-treasurer, 839 Seventeenth street, N. W., Washington 6, D. C.

Bridge and Building Supply Men's Association—E. C. Gunther, Secretary, 122 S. Michigan Avenue, Chicago 3.

Maintenance of Way Club of Chicago—Next meeting, November 28, 1949. E. C. Patterson, Secretary-treasurer, Room 1512, 400 W. Madison street, Chicago 6.

Metropolitan Maintenance of Way Club—Walter L. Turner, Jr., Secretary, 30 Church street, New York.

National Railway Appliance Association—R. B. Fisher, Secretary; Lewis Thomas, assistant, Secretary 59 E. Van Buren street, Chicago 5.

Railway Tie Association—Roy M. Edmonds, Secretary-treasurer, 610 Shell Building, St. Louis 3, Mo.

Roadmasters' and Maintenance of Way Association of America—Annual meeting, September 18-20, 1950, Hotel Stevens, Chicago. Elise LaChance, Secretary, 431 S. Dearborn street, Chicago 5.

Track Supply Association—Lewis Thomas, Secretary, 59 E. Van Buren street, Chicago, 5.

member preference in assignment to committees.

It is the expressed hope of President W. F. Martens that there be an unusually large request for committee appointments.

Metropolitan Maintenance of Way Club

An open-forum discussion on How We Are Meeting the Problems of the Shorter Work Week was the feature of the opening meeting of the club year, held on October 27 at the Hotel Shelburne, New York. President J. B. Bell served as moderator of the discussion in which a panel of seven supervisors, representing as many roads, participated.

The next meeting will be the annual luncheon. Following a custom of many years standing, this event will take place on the same day as the annual dinner of the New York Railroad Club—Thursday, December 8—and will be held at the Hotel Shelbourne.

American Railway Engineering Association

The most important events on the agenda of the association for November are meetings of the Board of Directors and the Nominating committee, which will meet on the same day, November 8. Only three meetings of technical committees have been scheduled for November. The Committee on Impact and Bridge Stresses will meet at Chicago on November 10, and the Committee on Wood Bridges and Trestles will meet on November 18, also at Chicago, and the Committee on Ties will hold its fall inspection on November 15, 16 and 17. Successively on these days the committee will inspect wood preserving plants at Gainesville, Fla., Atlanta, Ga., and Chattanooga, Tenn.

It is expected that Bulletin No. 483 (November) will be mailed to members the latter part of November. The reports of the Committees on Economics of Railway Location and Operations, Highways, Water Service and Sanitation, Yards and Terminals, Buildings, and Uniform General Contract Forms have been tentatively scheduled for publication.

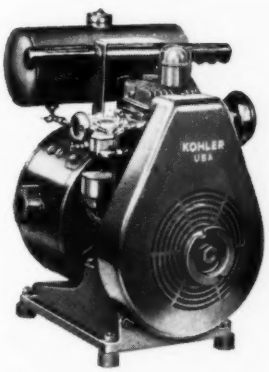
Wood Preservers' Association

The headquarters of the association, including the office of Secretary-Treasurer, Horace L. Dawson, have been changed from 1429 Eye Street, N. W., Washington 5, D. C., to 839 Seventeenth Street, N. W., Washington 6.

(Please turn to page 1122)

Kohler Electric Plant, mounted in Milwaukee Road tool car, lights 50 watt bulbs in foreman's, cook and bunk cars.

The Milwaukee Road uses KOHLER *Electric Plants* for lighting maintenance camp cars



Model 750M25, 750 watts, 115 volt AC. Manual control. Carrying handles. Length 20½", width 15¼", height 20¼". Weight 130 lbs.

The Milwaukee Road provides economical, thoroughly satisfactory lighting by means of Kohler Electric Plants for the camp cars of bridge and building maintenance crews. Approximately sixty-five Kohler units have been purchased for this purpose since 1946.

Kohler Electric Plants are practical for many railroad needs. The wide range of sizes, from the extremely light-weight, low-cost 350 watt unit to the heavy-duty 10KW model, will fill any requirement for economical independent light and power. Portable models are highly convenient for quick transport by "scooters" to construction or maintenance jobs where current is needed for night lighting and electric tools. Larger models serve efficiently for electro magnets, refrigerator cars, tunnels, floodlighting operations and other purposes.

Stand-by protection is particularly important on railway lines. There is no more reliable safeguard than a Kohler Electric Plant for signal systems, telephone communications and other essential equipment when storms or accidents interrupt control station electricity. Write for folder E-4. Kohler Co., Kohler, Wisconsin.

KOHLER OF KOHLER

PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS

Maintenance of Way Club of Chicago

With a large attendance, the first fall meeting of the club was held on October 24, and was featured by a discussion of the Economy of Increased Section Lengths, by Fred W. Creedle, assistant maintenance engineer, Chicago & North Western. As last year, the meeting was held at Eitel's restaurant in the Field Building. The next meeting of the club will be held on November 28.

Supply Trade News

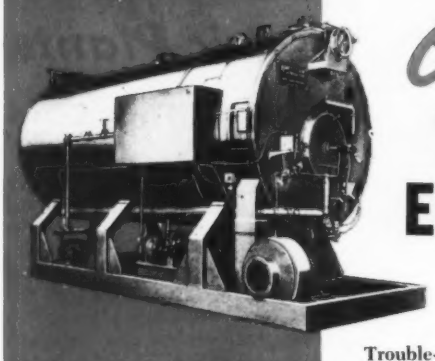
General

The **Graver Water Conditioning Company**, a division of the Graver Tank & Manufacturing Co., has announced the removal of its general offices to larger quarters at 216 West 14th street, New York 11.

AMESTEAM GENERATOR

"The Railroad Boiler"

PRODUCT OF AMES IRON WORKS, OSWEGO, N Y



Over 80% THERMAL EFFICIENCY

Check These Advantages

- 80% Thermal Efficiency
- 100% automatic
- Abolishes boiler room labor
- Uses oil or gas fuel or a combination of both
- No smoke—no soot
- Takes up ½ the space of conventional boilers
- Suitable for multiple installations
- Delivered complete ready for service connections.

Trouble-free, 100% automatic in operation, the AMESTEAM GENERATOR requires no chimney draft, only a simple vent to the atmosphere. Here is compact steam efficiency at its best. This unit takes up only one-third the space required by the conventional boiler. Important savings include elimination of boiler room labor and the fuel-saving advantages of a thermal efficiency of over 80%.

Ideal for low-pressure heat in station or shop, also for high pressure work for sand drying, Diesel de-icing and a host of other railroad applications.

Single units from 10 to 400 H.P. Suitable for multiple installations. Design pressure—15 to 200 lbs. Higher pressures on order.

See what this modern boiler can do for you. *Phone, write or wire.*

Exclusive Distributors to the Railroads

RAILROAD SUPPLY and EQUIPMENT, INC.

First Federal Building

148 ADAMS AVE., SCRANTON 3, PA.

Phone Scranton 7-3391

Personal

Koppers Company, Inc., has announced the appointment of **T. H. Cable** as a member of the sales department, central staff, with headquarters at Pittsburgh, Pa.

Frederick J. Fischer, sales representative of the **Simmons-Boardman Publishing Corporation,** publishers of **Railway Engineering and Maintenance** and other transportation papers, has retired after 30 years' service with the company.

John A. Roebling's Sons Company, Trenton, N. J., has opened a new office and warehouse in Cincinnati, Ohio, at 3253 Fredonia avenue, **W. K. Hanna,** formerly head of the Pittsburgh, Pa., branch, has been appointed manager of the new office.

T. E. Woodruff, manager of the St. Louis Branch House Pump department of **Fairbanks, Morse & Co.,** has been appointed assistant manager of the Pump Sales division, with headquarters in Chicago.

The **Food Machinery Chemical Corp.,** San Jose, Cal., has announced the appointment of **Gerald F. Twist** as manager of the firm's Peerless Pump division, with headquarters at Los Angeles, Cal., succeeding **Francis F. Fairman, Jr.,** who is joining the General Electric Company.

C. Victor Mars, former sales manager of the industrial chemical division of the **Ansul Chemical Company,** has been appointed manager of the new product department and **Robert J. Yaeger** has been appointed to succeed Mr. Mars.

L. F. A. Mitchell has been appointed sales manager of **Sperry Products, Inc.,** Danbury, Conn. He formerly was manager of headquarters sales of the Crocker-Wheeler Electric Manufacturing Company.

William J. Sparling, works manager of the **Chain Belt Company,** Milwaukee, Wis., has been elected vice-president and manager, chain and transmission division. He has been succeeded by **E. P. Meyer,** assistant works manager.

William E. Madden, vice-president of the **George Haiss Manufacturing Company,** New York, a division of the **Pettibone Mulliken Corporation,** Chicago, has been appointed also general sales manager of the former firm.

J. F. Hawkins, formerly at Pittsburgh, Pa., has been appointed district sales manager of the Detroit, Mich., territory of the Page steel and wire division of the **American Chain & Cable Co.,** with headquarters in the General Motors building.

W. S. Blakeslee, Jr., sales manager for the Wayne division, **Gar Wood Industries, Inc.,** Wayne, Mich., has been appointed assistant general sales manager for the corporation. He has been succeeded by **R. J. Nymberg,** who will have

charge of the sale and service of all products of the Wayne division nationally.

S. J. Woodworth has been appointed sales manager of the Wright Hoist division of the **American Chain & Cable Co.**, with headquarters at York, Pa., Mr. Woodworth, who has been with the Wright Hoist division for over 25 years, succeeds **A. R. Haskins** who is resigning, effective October 15, to establish a business in Milwaukee, Wis.

W. Henry Caban, whose appointment to assistant to the president of the **Taylor-Colquitt Company,** Spartanburg, S.

W. Henry Caban

C., was announed in the October issue was formerly a partner in the firm of Alinder & Caban, consulting engineers, Pittsburgh, Pa., and has been serving the Taylor-Colquitt Co., and other wood preserving companies as an engineering consultant and plant designer of timber treating plants and Vapor Drying Process plants since early in 1946. From 1930 through 1945 Mr. Caban was employed as an engineer by the Koppers Company, Wood Preserving Division, and its predecessor companies.

The **Link-Belt Company,** on September 27, opened a modern manufacturing plant at 3203 South Wayside, Houston, Tex. **Allen Craig,** formerly located at the firm's plant in Atlanta, Ga., is general manager of the southwestern division with headquarters at the new Houston facility

The company's Minneapolis, Minn., plant has announced the opening of a district sales office in Duluth, Minn., with headquarters at 422 Board of Trade building, 301 West First street, Duluth 2, **John E. Morrison,** formerly district sales engineer at Chicago and Minneapolis, has been appointed district manager in charge of the new office, assisted by **Harold A. Ivarson,** who has been transferred from Minneapolis.

Frederic E. Lyford, recently president of the **Merritt-Chapman & Scott Corp.,** and **William C. Eberle** have formed a partnership to continue and expand the

(*Continued on page 1124*)

Since I got this MICHIGAN, I've been able to handle a lot of the jobs around the country that I had to pass up before. That shovel gets to the job as fast as my trucks, and under its own power. It'll roll through city traffic without any trouble—and I don't have to worry about highway limits. Best of all, it'll pull in and out of any place the trucks can go. Yessir, my MICHIGAN is always ready to go—saves plenty of time too!

I looked 'em all over before I decided on MICHIGAN—and the way it has performed since convinces me that MICHIGAN is 'tops' as a money-maker.

DID YOU KNOW
you can buy
a brand new
MICHIGAN
TRUCK CRANE
complete with chassis
for as little as $10,250
F.O.B. factory?

Write for Bulletin 100, "*On the Job with* MICHIGAN"

MICHIGAN

MICHIGAN POWER SHOVEL COMPANY
400 SECOND STREET, BENTON HARBOR, MICHIGAN, U.S.A.

services rendered by Mr. Eberle to the petroleum and other industries in matters pertaining to transportation, terminal operations, economic studies, new construction, modernization and expansion, with headquarters at 36 East 36th street, New York 16. Mr. Lyford was associated with the Lehigh Valley from 1923 to 1934, in which year he joined the Reconstruction Finance Corporation as examiner for the railroad division. In 1936 he was appointed assistant to the vice-president of the Baldwin Locomotive Works and, in 1937, trustee of the New York, Ontario & Western, from which road he resigned to join Merritt-Chapman & Scott as assistant to the chairman of the firm.

Lloyd L. Brooks, industry specialist in the Construction Equipment division of **Worthington Pump & Machinery Corp.,** at Holyoke, Mass., has been appointed regional supervisor of that division, with headquarters at Washington, D. C., succeeding **John S. Bachman,** who has been appointed sales manager of the Ransome Construction Equipment Sales Division, with headquarters at Dunellen, N. J. Mr. Bachman succeeds **William F. Lockhardt,** who has retired.

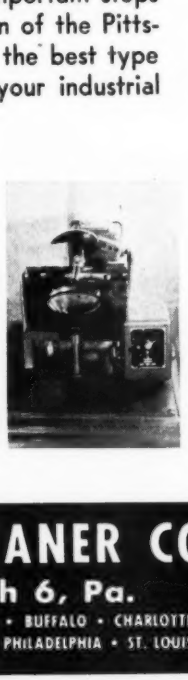
There are many STEPS to Industrial Waste Control

Federal, State and Municipal Regulations require that you take these steps *NOW!*

AND SAMPLING is one of the most important steps in the process. The Engineering Division of the Pittsburgh Pipe Cleaner Company is using the best type of sampler for quantitive analysis of your industrial waste.

Photo at left shows the refrigeration compartment where samples are held at correct temperature for chemical and toxicity tests.

Photo at right shows electric timing device to operate dipper motor. It may be adjusted to take from one to thirty samples per hour.



PITTSBURGH PIPE CLEANER CO.

133 Dahlem St., Pittsburgh 6, Pa.

BALTIMORE • BIRMINGHAM • BOSTON • BRADENTON, FLORIDA • BUFFALO • CHARLOTTE
CHICAGO • CINCINNATI • DETROIT • HOUSTON • NEW YORK • PHILADELPHIA • ST. LOUIS

Miles D. Catton, manager of the **Portland Cement Association's** soil-cement bureau since 1941, has been appointed director of developments. The work of the development department under Mr. Catton's supervision will be directed toward, among other things, improved uses of portland cement concrete and soil-cement in the railway field and in erosion control, water, sewerage and drainage facilities.

Frederick C. Koch, vice-president of **Simmons-Boardman Publishing Corporation,** member of its board of directors, and business manager of Railway Signaling and Communications, one of its railway publication, died on October 17, at the Mary Immaculate Hospital, Jamaica, N. Y.

Mr. Koch was born in Jersey City, N. J., on June 9, 1893. He began his business career with the Railway Age Gazette (now Railway Age) in 1909, and

Frederick C. Koch

worked successively as copy runner, office boy, clerk in the subscription mailing department, clerk in the circulation department, manager of the advertising makeup department, and assistant to vice-president. In 1917, he was appointed advertising sales representative for all Simmons-Boardman transportation publications. Eight years later he was appointed business manager of **Railway Engineering and Maintenance.** He was elected a vice-president of the publishing firm in 1936, as director in 1937, and business manager of Railway Signaling and Communications in 1944.

Trade Publications

(To obtain copies of any of the publications mentioned in these columns, use postcards, page 1039)

Chemical Weed Control—The Montsano Chemical Company has published an integrated series of seven booklets describing the method and advantages of controlling weeds with chemical sprays. The booklets include instructions for formulating the company's basic herbicidol chemicals, both contact and translocated, and the proper compounds

and rates of application for various uses. The series includes a booklet dealing specifically with chemical control of weeds on rights-of-way.

New American Model 410 Diesel Locomotive Crane—The American Hoist & Derrick Co. has issued a four-page bulletin presenting the design features and specifications of its new 10-ton unit for high-speed work.

Improved Industrial Vision, a Bonus for Management, a Benefit for Employees—The American Optical Company has published a 24-page brochure describing AO programs for sight conservation in industry, which, in providing a rapid check of employee vision, screen those who require correction for maximum safety and efficiency. The publication features case histories and charts demonstrating the cost-saving values of such programs.

Aircomatic Process—Air Reduction Sales Company has announced a four-page illustrated folder on the recently introduced Aircomatic welding process. This process is a gas-shielded, metal-arc method of welding, which permits the joining of heavy sections of aluminum, aluminum-bronze and stainless steel in all positions. The folder covers the features of the process and equipment, and the illustrations include photographs of work done by this process.

Amesteam Generators—Railroad Supply & Equipment, Inc., is offering a catalog describing the complete line of Amesteam generators – fully-automatic steam-producing units, of many different capacities, fired by light or heavy oil, natural or manufactured gas, and oil-gas combinations. These catalogs are available with board-backed red leather covers, and with the name of the person being supplied printed in gold letters in the lower right-hand corner.

White Railway Switch Heaters—The White Manufacturing Company has published an eight-page illustrated booklet describing the White switch heaters, including the Model G-1 oil-burning units and the Model G-3 gas-burning units. The bulletin emphasizes that White heaters can now be installed for automatic operation on any system of remote-controlled switches on regular signal circuits, and gives details of the remote-control apparatus. The booklet concludes with descriptions of other White equipment for railroads.

Link-Belt Gearmotors—The Link-Belt Company, Chicago, has published a 12-page catalog, designated as No. 1815A, describing and illustrating Link-Belt Gearmotors, including double and triple-reduction units of new design and units having totally-enclosed and explosion-proof motor enclosures. The booklet has a new, single selection table for easier and more accurate selection of Gearmotor sizes; a new listing of minimum sprocket wheel diameters; and a table of maximum permissible overhung loads.

New Light Weight POWER FOR FASTER TRACK WORK

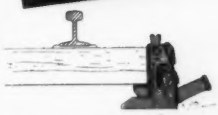
Aluminum Alloy

Simplex No. A5

UNIVERSAL TRACK JACK

Speeds

TAMPING – BALLASTING



SURFACING

LINING

Greater portability—weighs only 28 lbs. —with no sacrifice of strength, makes this jack a "must" for maintenance-of-way crews doing more work faster. Simplex No. A5 has 15 tons capacity, large forged toe lift surface of 2½" x 3¼". Simplex-engineered, aluminum alloy housing, reinforced at stress points, has the strength of malleable jacks weighing 45% more!

• SIMPLEX A17 TRACK JACK

Aluminum Alloy Housing—41½ lbs. Light—15 Tons Strong!

For general track jacking. Built with 40% extra support at stress points to equal strength of malleable jacks that are 45% heavier! Large toe lift area (2½" x 3¼") permits jacking under ends of ties without damage. Shorter fulcrum center. Safety thumbguard. Lifts full capacity on cap or toe! Height 22¾" with 13" lift.

SIMPLEX RAIL EXPANDERS

One man with No. 550 replaces rail pounding crew. Avoids batte..ed rail ends, bolts or crossings. Easy to operate. 25 tons capacity. (Also available in two other models of 15 and 30 tons capacity.)

SIMPLEX SAFETY JACK SUPPORTS

Made of aluminum alloy. Only four needed to handle safely the heaviest structure. Far stronger than wooden wedges. Use as shown or inverted with Simplex Standard Speed Journal or Bridge Jacks.

Tune in the RAILROAD HOUR

MONDAY NIGHTS ABC NETWORK

Simplex LEVER • SCREW • HYDRAULIC Jacks

1899 50 Years 1949

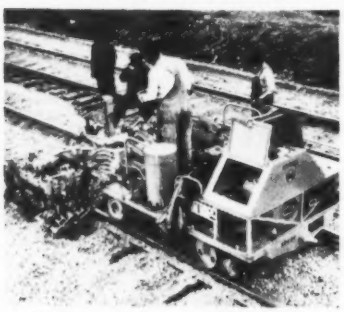
TEMPLETON, KENLY AND COMPANY
1026 South Central Ave., Chicago 44, Illinois

Everywhere on the MAIN LINES

One man in one minute super-tamps and finishes up to 80 sq. ft., of surface with this Wisconsin-powered Wayer Impactor.

WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES...

KEEP JOBS ON SCHEDULE



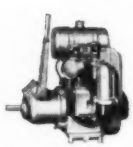
This Wisconsin-powered Jackson Multiple Tamper carries *12 tampers and finishes* track in one operation.

Wherever track gangs are working, the chances are you'll find one or more pieces of equipment powered by Wisconsin Air-Cooled Engines . . . because these are the most generally accepted and specified engines in the 2 to 30 hp. field among builders of universally used railway maintenance equipment.

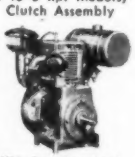
Wisconsin Engines rate top preference both by equipment manufacturers and track gangs because these engines can be counted on for steady-going dependability under the most rugged operating conditions . . . regardless of climate, season or weather. You get properly balanced cooling from sub-zero to 140° F., through high volumetric flywheel-fan air distribution. A weather-sealed, rotary type high tension outside magneto, equipped with impulse coupling, gets the engine away to fast starts and keeps it turning smoothly and steadily. Tapered roller bearings at *both* ends of the drop-forged crankshaft (on *all* sizes of engines) handle all thrust loads, providing fullest protection against bearing failures.

And with a torque curve peaking at relatively low r.p.m., Wisconsin Engines have plenty of "give and take" horsepower margin for the hard pulls without stalling. In addition to which these engines are extremely compact and light in weight for easy portability and handling.

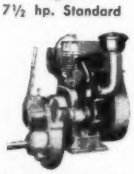
In other words, by specifying "Wisconsin-powered equipment", you have the best assurance of keeping maintenance jobs moving on schedule.



2 to 6 hp. Models, Clutch Assembly

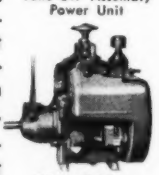


7½ hp. Standard



6 to 9 hp., Clutch Reduction Assembly

7 to 13 hp., Clutch Take-Off Assembly Power Unit



15 to 25 hp., Clutch Assembly

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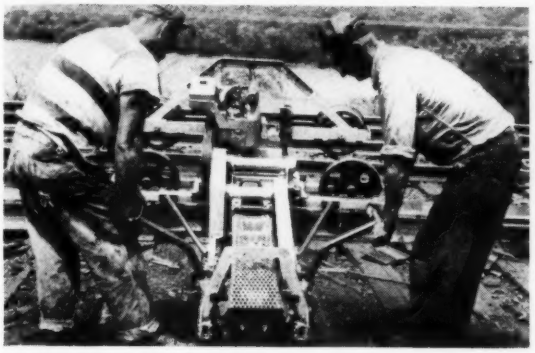

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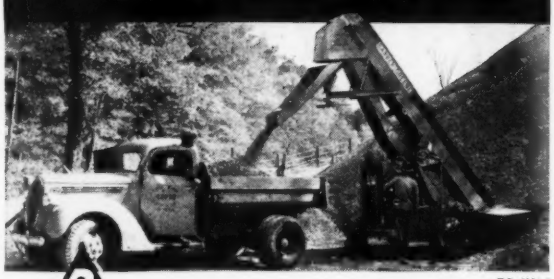

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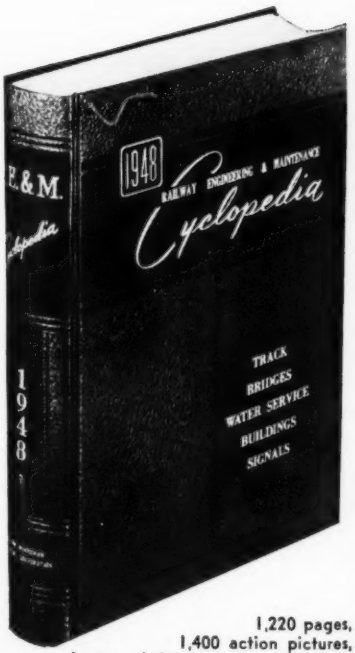

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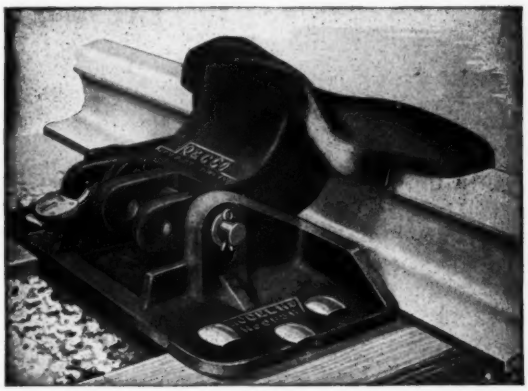

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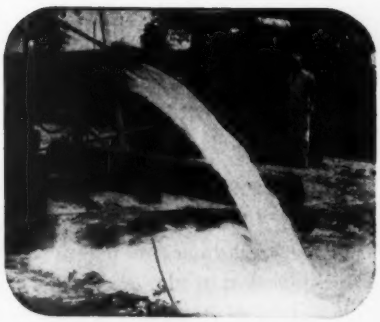

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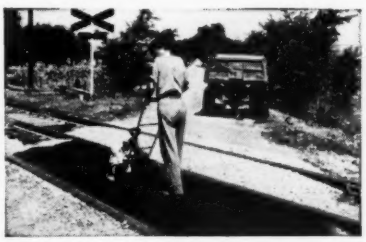

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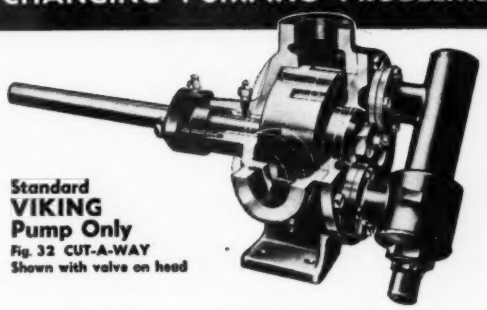

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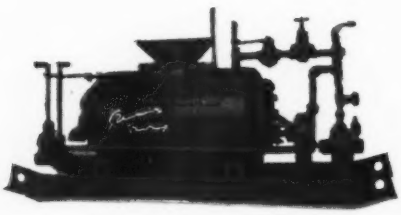

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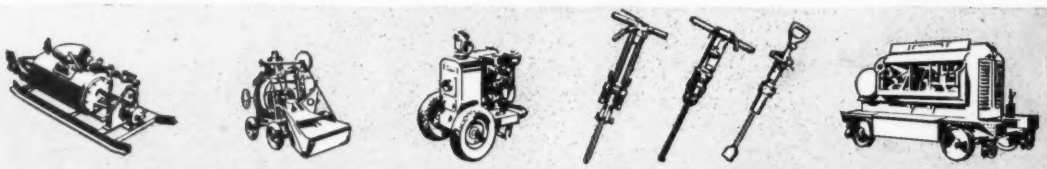

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